

# **USER'S GUIDE to TANKS**

Storage Tank Emissions Calculation Software  
Version 3.1

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Emission Factor and Inventory Group  
Emissions, Monitoring, and Analysis Division  
Office of Air Quality Planning and Standards  
U.S. Environmental Protection Agency

# USER'S GUIDE to TANKS 3.1

## Storage Tank Emissions Calculation Software

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## 1.0 INTRODUCTION

The TANKS program is designed to estimate air emissions from organic liquids in storage tanks. The U.S. Environmental Protection Agency's (EPA) Office of Air Quality Planning and Standards (OAQPS) develops and maintains emission estimating tools to support Federal, State, and local agencies, consultants, and industry with estimating air emissions from various sources. This user's manual provides installation and general use instructions for the TANKS software. It is not intended to document how to estimate air emissions from storage tanks. The Air Pollution (AP) 42 series is the principal documentation of emission factors and calculations used to estimate air emissions; therefore, please consult AP-42 Section 7.1, Organic Liquid Storage Tanks, for specific information about emissions from organic liquid storage tanks.

TANKS allows users to enter specific information about a storage tank (dimensions, construction, paint condition, etc.), the liquid contents (chemical components and liquid temperature), and the location of the tank (nearest city, ambient temperature, etc.), and generate an air emissions report. Report features include estimates of monthly, annual, or partial year emissions for each chemical or mixture of chemicals stored in the tank.

Version 3.1 of TANKS, hereafter referred to as TANKS 3.1, represents an upgrade to versions 3.0, 2.0, and 1.0 and includes several new features and revisions to maintain consistency with EPA emissions calculation methodology and to respond to users' comments. These new features are described below. The program was written in Foxpro programming language, a dBase compatible language, and a runtime version of Foxpro has been distributed with the system. The program is intended for use on systems running DOS version 3.3 or higher. No additional software is needed.

Please note that the emission estimating equations that form the basis of the TANKS 3.1 software program were developed by the American Petroleum Institute (API). API retains the copyright to these equations. API has granted permission for the nonexclusive, noncommercial distribution of this material to governmental and regulatory agencies. However, API reserves its rights regarding all commercial duplication and distribution of its material. Therefore, the TANKS program is available for public use, but the program cannot be sold without written permission from the American Petroleum Institute, the U.S. Environmental Protection Agency, Midwest Research Institute, and Perrin Quarles Associates, Inc.

### 1.1 TANKS User Assistance and Response

TANKS 3.1 may require revisions and modifications to ensure consistency with EPA emission calculation methodologies. The EPA welcomes feedback on this program to identify limitations and suggest modifications to TANKS.

### 1.2 Obtaining TANKS Version 3.1

To obtain a copy of TANKS 3.1 please write or call EPA at the following address:



Info CHIEF  
U.S. EPA  
MD-14  
Research Triangle Park, NC 27711  
(919) 541-5285

In addition, both the TANKS 3.1 software and AP-42 documentation are available on the CHIEF file area of EPA's Technology Transfer Network (TTN) electronic bulletin board system ((919) 541-1447 or at the Internet address <http://www.epa.gov/ttn/chief>). To obtain a copy of TANKS 3.1, download the file TANKS31.ZIP from the TTN to your computer. This file is in a compressed or "zipped" format. To unpack the files (INSTALL.EXE, PK\_\_\_\_.EXE, DATA.ZIP, PROGRAM.ZIP, TANKDATA.ZIP, and MANUAL.WPD) go to the DOS prompt and type "PKUNZIP TANKS31.ZIP" from the subdirectory where the TANKS31.ZIP file resides. Then run the install utility by typing "INSTALL" in the directory where the files were unzipped. Refer to section 2.2 for detailed installation instructions.

### **1.3 What Was New in TANKS 3.0**

#### Emission Factor Changes

- (1) New roof/deck fitting factors have been developed by API that are now applicable to both internal floating roof tanks and external floating roof tanks for wind speeds up to 15 mph. New factors were not developed for 2 1/2 inch deck legs or non-automatic gauge float wells, so these fittings are not included in the new version. When TANKS 2.0 data are imported, any 2 1/2 inch legs in tank records will be converted to 3 inch automatically. Fitting factors for additional configurations for slotted and unslotted guide-poles have also been added to the program.
- (2) A new rim seal loss estimating equation and corresponding factors were also developed by API. The factors are applicable to all types of floating roof tanks for wind speeds up to 15 mph.
- (3) A wind speed correction factor is included in the EFRT fitting loss estimating equation to account for the shielding effect of the tank shell. The factor is set to a value of 0.7.
- (4) Options for estimating emissions from Domed External Floating Roof Tanks are available.
- (5) There is no longer a "controlled" fitting category, only typical and detailed. Controlled fitting configurations imported from TANKS 2.0 will be designated as detailed.
- (6) A heated tank option is included in this version for fixed roof tanks. The user must specify the liquid surface and bulk temperatures for heated tanks.

### Format and Utility Changes

- (7) The program performs a data quality check on startup to check if program supplied fittings, seals, cities, or chemicals have been altered from outside of TANKS 3.1. The program also automatically packs (deletes marked records) the databases on exit. These two features should help prevent indexing problems.
- (8) The user may enter tank dimensions and liquid height to one decimal place, e.g., 10.5 ft.
- (9) The user may specify zero turnovers and the program will calculate breathing loss. Withdrawal or working loss will automatically be zero since there is no throughput.
- (10) The user may modify the status of a fitting without having to delete the fitting and add a new one.
- (11) The user may modify the atmospheric pressure for any city in the meteorological database, whether program supplied or user defined (the default is set to 14.7 psi). The program will not allow the user to run a report if any vapor pressure value for any month is greater than the atmospheric pressure specified for the location (i.e., boiling liquids).
- (12) The user may specify the type of secondary rim seal.
- (13) Vapor pressure calculation options other than the Reid vapor pressure may be used for crude oils.
- (14) If a city, chemical, fitting, or rim seal is modified, the program will automatically update every tank record that contains the modified item.
- (15) A change in internal floating roof tank diameter value automatically updates the deck seam length value.
- (16) Users may estimate fitting factors from within the program.
- (17) Users may add, view/edit, delete, and print information for deck fittings and rim seals. (Only user defined records in the databases may be edited or deleted.)
- (18) A description field has been added to each tank record for the user to input comments about the tank.
- (19) The user may copy tank data without having to create a profile. Tank, liquid, or all information may be copied into a new record.
- (20) Users may have multiple data directories and merge data directories. The user must first create the directories and then export the database structures to the new directories. For example, each facility or site could have its own directory.

- (21) Report format changes: (1) withdrawal loss has been changed to working loss for fixed roof tanks, (2) the detail report shows losses for individual fittings.
- (22) Users may specify LPT1 or LPT2 as their printer port.
- (23) Approximately 60 chemicals were added to the chemical database.
- (24) The user may specify the last four characters of TANKS backup filenames.
- (25) Mechanical shoe rim seals are available for internal floating roof tanks.

#### **1.4 What's New in TANKS 3.1**

- (1) TANKS 3.1 includes an additional slotted guide pole configuration.
- (2) TANKS 3.1 includes a revised deck seam loss factor for IFRT's.
- (3) TANKS 3.1 includes the correct liquid density values (instead of condensed vapor density) for petroleum distillates and crude oil. Vapor pressures have also been added for residual oil #6.
- (4) The user may now enter both the liquid and vapor molecular weights into the chemical database.
- (5) Brief reports are now separated into standing and working loss.

## 2.0 INSTALLATION AND SET-UP

### 2.1 Operational Requirements

The following software and computer hardware are needed to use TANKS 3.1:

**Software.** The program was written in Foxpro programming language, a dBase compatible language and a runtime version of Foxpro has been distributed with the system. The program is intended for use on systems running DOS version 3.3 or higher. No additional software is needed.

**Hardware.** For a stand-alone, single-user system, TANKS 3.1 requires, at a minimum, an IBM-compatible 386 DX, 33 MHz computer with 4 Mb of Random Access Memory (RAM). A 486 DX computer or higher with 8+ Mb of RAM is recommended for improved performance. At least 15 Mb of hard-disk storage space should be allocated for the TANKS 3.1 program and data. Additional space may be required to accommodate large databases or back-up databases.

Network requirements for use of TANKS 3.1 on a local area network (LAN) include the following: The LAN must be Net BIOS-compatible. Most networks, including Novell, Banyon, Vines, IBM PC Network and 3Com+ , meet these requirements. Some network software supports Net BIOS calls automatically; others must load a Net BIOS shell before running Foxpro LAN. Consult your LAN administrator or LAN documentation for information about your system. A server which is an IBM-compatible 386 DX, 33 MHz computer with a minimum of 4 MB of RAM is needed to run TANKS 3.1. Each work station should also meet the single-user requirements above, with the exception of the hard-disk storage requirement.

### 2.2 Installation

These instructions apply to installations on both stand-alone and LAN systems. If you are installing TANKS 3.1 on a LAN, you must be logged into the LAN and have the rights necessary to create and delete directories and files. You may need to consult your LAN administrator.

The program files are shipped in a special, archived format that must be installed using the included utility: they cannot be simply copied from the diskette. Insert the program diskette into the floppy drive on your computer (or download TANKS31.ZIP to a directory on your hard drive from the TTN or Internet), select the drive, and unzip TANKS31.zip to a directory on your hard drive or network, such as c:\temp. In MS-DOS mode:

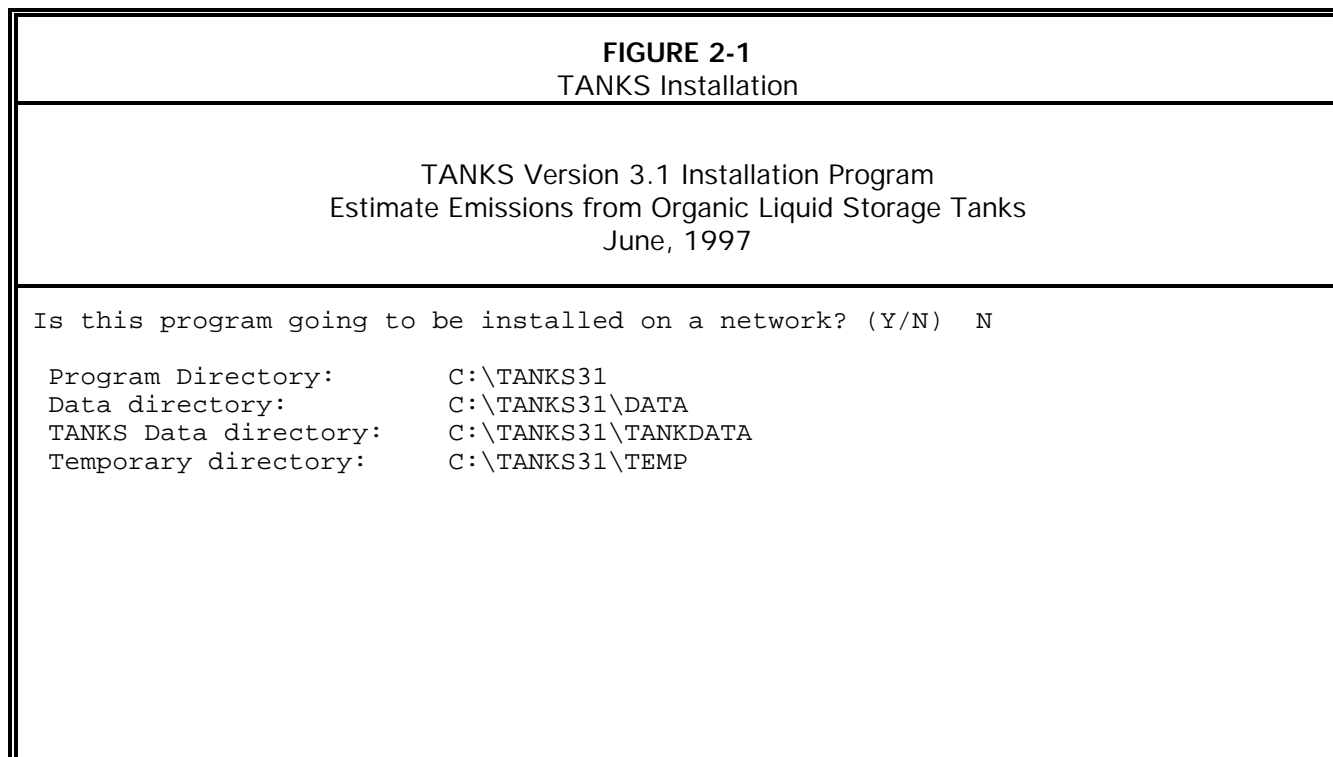
```
TYPE: PKUNZIP TANKS31.ZIP C:\TEMP
```

The TANKS31 user manual, install utility, and associated files will be unzipped to your hard drive. Then run the INSTALL program from the TEMP directory. In MS-DOS mode:

```
TYPE: INSTALL [Enter]
```

If you are running Windows on your system, you may have to restart your computer in MS-DOS mode for the install utility to work properly.

The screen shown in **Figure 2-1** should appear. The installation utility will ask you to specify whether you are installing the program on a network and then will ask you to specify the directories in which the program is to be installed. Accepting the default names will install TANKS 3.1 on your computer's hard drive and create the necessary directories.



**Program Directory.** The program directory is the directory in which the Foxpro program files, archiving software, screen color files, and configuration files will be placed. This directory must be placed on a hard-drive or network drive with adequate free space (approximately 5 Mb).

For network installations, a network drive should be selected. Selecting a local drive (e.g., C:\) requires that TANKS 3.1 be installed on every computer that will run the program from the LAN.

TANKS 3.1 will not be writing information to this directory during normal operation, therefore the files may be set to "read-only" by a network security system or by DOS's attribute flags to prevent accidental changes or deletions.

**Data Directory.** The data directory is the directory in which the core data files containing chemical, city (meteorological), roof fitting factor, rim seal factor, printer driver, and other databases are stored. Because users may add new data to these core databases, users must have read-write access to this directory. This directory must have adequate free space (approximately 2 Mb).

For network installations, a network drive must be selected for the TANKS 3.1 data to be accessed from other work stations.

**Tank Data Directory.** The data directory is the directory in which the tank data entered by the user will be stored. This directory contains four databases (fittings, mixture, storage, and tank) that comprise each user's tank data. This is where data from previous versions of TANKS or data taken from another user may be copied. Users should use the import and restore features from within TANKS 3.1 to load new data into this directory as described in **Section 6 Database Utilities**. Because users may add new data to these databases, users must have read-write access to this directory. This directory must have adequate free space (approximately 5 Mb).

For network installations, a network drive must be selected for the TANKS 3.1 data to be accessed from other work stations.

**Temporary Directory.** The temporary directory is the directory where temporary files are stored and deleted during normal execution of the program. This directory should be placed on a drive with at least 5 Mb of free space, in addition to the space requirements listed above. Like the data directory, the temporary directory must provide users "read-write" access.

### 2.3 Configuration Files

The installation utility will check to ensure that the computer's CONFIG.SYS file contains the following line:

```
FILES= 99
```

If necessary, this line will automatically be added to the CONFIG.SYS and a relevant message will appear during installation. If this occurs, it will be necessary to re-boot the computer after the installation procedure is completed and before accessing the program in order for this change to take effect. Also, some systems may have read-only security protection on Configuration files and may not allow TANKS to modify the CONFIG.SYS file. Consult your computer administrator to make these changes.

For network installations, a similar command will be placed in a network configuration file. This file may be named SHELL.CFG, NETX.CFG, or a similar name. In Novell Netware 3 or earlier networks, the network configuration file must contain the following statement:

```
FILE HANDLES = 99
```

If changes are made to this file, be sure to reboot your computer before continuing.

Please note that changes to the CONFIG.SYS and network configuration file affect only the computer on which the actual installation procedure is performed. To enable access to TANKS 3.1 from other workstations on the network, similar changes may have to be made to their CONFIG.SYS and network configuration files. For help editing these files, please consult your technical support staff.

### 2.4 Color Monitors

TANKS 3.1 provides color menus and screens on color monitors. In most cases, the program will automatically detect the type of monitor in use and make the necessary settings. On some monitors, however, the default colors may be inappropriately selected. You may disable or adjust the color selection from within TANKS 3.1 from *System Utilities* Menu. For further information on this option, see **Section 7 System Utilities**.

## 2.5 Protecting Your Data

Menu options are provided to copy databases in either un-archived (.DBF) or archived (.ZIP) format to floppy disks. Also, upon exiting the program you will have an opportunity to make backup copies of data and system files. Backup copies of the data files should be made on a regular basis to a floppy disk or tape backup system. **It is recommended that successive generations of backup copies be made and preserved to ensure that copies of data are available in case of hard-disk failure or other data problems!**

## 2.6 Trouble Shooting

**"Too Many Files Open" or "File Not Found" Message.** This error message appears when the FILES statement contained in the CONFIG.SYS file on the computer has not been properly modified or if the network configuration file has not been modified. (For information on these files, see **Section 2.3 Configuration Files** above.) Please note that the computer must be rebooted for any changes to configuration files to take effect.

**Memory Problems.** Foxpro is a memory intensive application. To make the user aware of serious memory limitations, we have included a memory checking program that quickly checks available memory each time the program is accessed. If available conventional memory is less than 40K, a screen appears cautioning the user about this condition. With limited memory the program will continue to operate, but this condition may cause unpredictable errors. If this type of random error occurs, contact your computer specialist to identify how memory limitations can be alleviated. In particular, you may need to disable temporarily any non-essential memory-resident programs on your system, such as memory-resident virus protection software. If you have memory available on your computer above the standard 640K, you may want to consider accessing this memory by installing a memory manager such as HIMEM.SYS or QEMM.

**Data Contamination.** Occasionally, hard-disk problems or other system malfunctions will create "contaminated" data files. Contaminated data files are characterized by random stray characters in the data or by data that has shifted from one field to another field throughout a record or a range of records.

These problems are not caused by software and may indicate an underlying hard-disk problem. They can be corrected either by replacing the data with back-up data or by deleting and reentering the contaminated records. In many cases, this may be accomplished most easily using dBase compatible software. Repeated data file contamination may indicate a memory conflict or the need for additional hard-disk maintenance procedures.

**Other Problems or Errors.** If other types of problems occur, please note the following:

- ! What operation was being attempted?
- ! Has this operation been completed successfully before?

- ! Has the hardware on your computer been recently changed or modified?
- ! What operations were performed prior to the operation?
- ! Exit and reenter the program. Does the error still occur?

The system contains an error-catching program that records the following information to facilitate error diagnostics:

- ! Program Name
- ! Line Number
- ! Error Type Code
- ! Memory Variables in Use
- ! Database in Use
- ! Indexes in Use

If an error occurs, a brief summary of this information will be displayed on the screen. We recommend that you record the information presented on the summary screen by pressing the PRINT SCREEN key ([Shift] + [Print Screen] on many keyboards), and have this information available when you call for assistance.

For technical support please call:

Info Chief  
U.S. Environmental Protection Agency  
MD-14  
Research Triangle Park, NC 27711  
(919) 541-5285



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### 3.0 GETTING STARTED

To start TANKS 3.1, go to the TANKS program directory (default location C:\TANKS31) and type "TANKS" to execute the program. It is recommended that you fully exit any other applications, including Windows, to avoid having insufficient conventional memory to run TANKS 3.1. Your system administrator may be able to configure your system to run using extended memory allowing start-up from Windows or from network menus. Upon start-up, a screen will appear describing API's copyright to the emissions equations. Pressing enter to continue causes the *TANKS Main Menu*, as shown in **Figure 3-1**, to appear.

**FIGURE 3-1**  
TANKS Main Menu

[illegible]

As shown in **Figure 3-1**, the top of the TANKS 3.1 screen contains information on the version of TANKS being used and the date and time maintained by your computer's internal calendar and clock. Consult your computer's documentation or obtain help from a computer administrator to set the internal clock and calendar.

### 3.1 Getting Around

The following keys and conventions will assist you in moving through the menus and records contained in TANKS 3.1:

**Menu Options.** To select menu options, move the highlight bar to your selection by using the up/down arrow keys and press [Enter]. You may also simply type the number of the option, or you may use a mouse to point and click to select an option.

**Arrow Keys.** The up and down arrow keys move the cursor or highlight bar up or down. The right and left arrow keys move the cursor to the left or right.

**Home Key.** The [Home] key moves the cursor or highlight bar to the beginning of a line, to the top of a window, to the top of a list, or the top of a menu.

**End Key.** Successive use of the [End] key during data entry moves the cursor or highlight bar to the end of a line, to the end of a window or menu, and to the bottom of a list.

**Page Up and page Down.** The [PgUp] and [PgDn] keys scroll lists up one page or down one page; during data entry, these keys move screens.

**[+] Symbol.** The plus symbol marks a record to be included where multiple selections can be made. Marked records appear highlighted.

**[-] Symbol.** The minus symbol unmarks a previously selected record where multiple selections can be made. Unmarked records will no longer be highlighted.

**Ctrl Key.** When told to press the [Ctrl] key and another key, hold both keys down at the same time. For example, when told to press [Ctrl-End], press [Ctrl] and [End] down at the same time.

**Function Keys.** The function keys ([F1], [F2], [F3], ...etc.) are single keys, usually located at the top or on the left of the keyboard. The function of each key depends on the menu or screen currently being viewed. TANKS 3.1 will display active function keys at the bottom of each window as appropriate.

**Use of a Mouse.** Clicking the mouse pointer on any option will select that option. Windows may be moved around on screen by clicking on the title of a menu and holding the mouse button down while dragging to the desired position. During data entry, clicking on a field will move the cursor to that field. Also, clicking on a highlighted letter of a suggested response, such as "Save Changes (Yes or No)?", has the same effect as typing the letter.

### 3.2 Help System

You may access the Help screens from almost anywhere in the program by pressing [F1]. Pressing [F1] brings up the Help screen that most directly relates to the current menu option, screen, or field. If the word "More ↓" appears in the lower right hand corner of the Help screen, the user may scroll up and down within that Help screen using the up and down arrow keys.

A topic may have more than one Help screen. Page up or down to scroll through the screens. Press [Esc] to return to the program.

From any Help screen press [F1] again to review the Help Screen Index. Scroll through the Index using the up/down arrow keys. To view a Help screen from the Index, move the highlight bar to the title of the desired screen and press [Enter]. Press [Esc] to return to the program from the Help Screen Index. Press [F1] to return to the Help screen from the Help Screen Index.

### 3.3 TANKS Main Menu

There are six options on the *TANKS Main Menu* as shown in **Figure 3-1**. These options are described below.

**Overview.** This option provides a description of the TANKS program.

**Tank Records.** This option brings up the *Tank Records* Menu which has options to add, edit, or delete tank records contained in the database. For information on entering tank data, see **Section 4 Entering Tank Data**.

**Generate Emissions Report.** Use this option to create a report for an individual tank or a batch of reports for a group of tanks. After generating the report, you may view the report on-screen, print the report, or export the report to an ASCII or printer ready file.

**Database Utilities.** This option brings up the *Database Utilities* menu which contains options for performing various tasks involving the management of databases and files. There are options to view, edit, and print the four core databases (chemical.dbf, cities.dbf, fit\_tbl.dbf, and rim\_seal.dbf) which contain chemical data, meteorological data, roof fitting factors, and rim seal loss factors, respectively.

In addition, this menu provides options to import and export TANKS data and make back-up copies of the databases. To import data created with TANKS versions 1.0 or 2.0, consult the instructions below under **Section 3.4 Using a Previous Database**.

The *Database Utilities* menu also provides the ability to re-index the databases, which may be important if any of the tank data have been manipulated outside of the TANKS 3.1 program using Foxpro, dBase, or another program.

**System Utilities.** This option brings up the *System Utilities* menu which offers options to select printers and screen colors, change printer ports, view information about how TANKS 3.1 was set-up and how much memory and space are available (useful in troubleshooting), and shell to DOS. "Shelling" to DOS provides the ability to temporarily exit the program to perform other DOS functions, such as copying, without completely exiting the program.

**Exit to DOS.** This option terminates the program session. Please exit the program before turning off your computer as your data may be damaged by shutting down without exiting. Upon exiting, you will be asked whether you want to make a backup copy of the database.

### 3.4 Using a Previous Database

In getting started, TANKS 1.0 and 2.0 users may wish to import their TANKS data into the TANKS 3.1 program. Although this utility is described in **Section 6 Database Utilities** it may be useful in getting started to follow a quick set of instructions. Importing data may be accomplished by following the steps below.

- Step 1: Identify the directory where the TANKS version 1.0 or 2.0 tank data are stored. Please note that if the TANKS 1.0 or 2.0 data are archived (zipped), you must unzip them so each file is available. Use the command **PKUNZIP < filename>** to unpack the file contents.
- Step 2: From within TANKS 3.1, select **Database Utilities** from the *TANKS Main Menu*, followed by **Import/Export TANKS Data** from the *Database Utilities* menu, followed by **Import TANKS Data (DBF Format)** from the *Import/Export TANKS Data* menu.
- Step 3: The program will ask you for the version of the tank data being imported. Enter either 1.0 or 2.0.
- Step 4: Enter the drive and directory where the imported data are located.

The program will add imported tank records to the current database. Also, any user-defined chemicals or cities (meteorological data) will be added to the appropriate databases. Please note that some of the standard selections for roof fitting and rim seal descriptions and loss factors may have changed from versions 1.0 and 2.0 to versions 3.0 and 3.1 (see **Section 1.3 What Was New in TANKS 3.0** and **Section 1.4 What's New in TANKS 3.1**). The program will convert data to the new fittings and rim seals. To use data generated in TANKS 3.0 in TANKS 3.1, use the Merge Data Directories function under the Database Utilities menu (see Section 6.9).

## 4.0 ENTERING TANK DATA

The TANKS 3.1 program requires certain information about a storage tank and the liquid it contains to calculate the tank's air emissions. This information is entered and stored in tank records. There are four categories of information in a tank record:

**Tank Information.** Identification information, construction type, and physical characteristics of the storage tank.

**Fitting Information.** For floating roof tanks only, there is a separate data entry screen for deck and roof fitting information.

**Site Information.** The tank's nearest major city and state for which meteorological data are available is necessary to assign ambient temperature, atmospheric pressure, and wind speed variables to the tank information. You may add new cities to the database using the **Database Utilities** option from the *TANKS Main Menu*.

**Liquid Information.** Identification of chemical components and properties of the stored liquid is needed to determine the overall vapor pressure of the liquid and the vapor constituents present in any air emissions. Time periods for which each chemical or mixture is stored are also required. You may add new chemicals or mixtures to the database using the **Database Utilities** option from the *TANKS Main Menu*.

It is important to enter as much information as possible to ensure that each variable in the AP-42 calculations is available to the program. Insufficient information may prevent the program from generating an emissions report.

To add new tank records, select **Tank Records** from the *TANKS Main Menu*; then select **Add New Tank Record** from the *Tank Records* menu. The program will display a list of storage tank types (see **Figure 3-1**). Choose the type of tank you wish to enter. Please note that while entering tank records, the program automatically saves all edits and entries. There is no need to "save" changes.

**FIGURE 4-1**  
Adding New Tank Records

```
TANKS Program 3.1                      September 9, 1995  10:46
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!+)))))) TANKS Main Menu ))))))),!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!*                                     +)))))) Tank Records ))))))),!!!!!!!!!!!!!!!!
!!!* 1. Overview                        *                                     *!!!!!!!!!!!!
!!!* 2. Tank Records                   * 1. Add New Tank Record             *!!!!!!!!!!!!
!!!* 3. Generate Emissions Report      * 2. Edit Existing Tank Record        *!!!!!!!!!!!!
!!!* 4. Database Utilities             * 3. Delete Existing Tank Record     *!!!!!!!!!!!!
!!!* 5. System Utilities               *                                     *!!!!!!!!!!!!
!!!* 6. Exit to DOS                   .))))))-!!!!!!!!!!!!
!!!*                                     *!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!.))))))-!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!+)))))) Add New Tank Record ))))))),!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!*                                     *!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!* 1. Vertical Fixed Roof Tank                        *!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!* 2. Horizontal Fixed Roof Tank                    *!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!* 3. External Floating Roof Tank                  *!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!* 4. Internal Floating Roof Tank                  *!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!* 5. Domed External Floating Roof Tank            *!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!*                                     *!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!.))))))-!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!

<F1> Help
```

#### 4.1 Tank Types

TANKS 3.1 provides different data entry screens for five different types of tanks. Highlight the appropriate tank type and press **[Enter]**. Each of these types is described below.

**Vertical Fixed Roof Tanks.** These tanks consist of cylindrical shells with permanently affixed roofs; the tank axis is perpendicular to the foundation. The fixed roof may be dome-shaped or cone-shaped. Vertical fixed roof tank shells are usually constructed of steel. These tanks may be specified as "heated" in TANKS 3.1.

**Horizontal Fixed Roof Tanks.** These tanks are constructed for both above-ground and underground storage with the axis parallel to the foundation. Horizontal fixed roof shells may be steel, steel with a fiberglass overlay, or fiberglass-reinforced polyester. These tanks may be specified as "heated" in TANKS 3.1.

**External Floating Roof Tank.** This type of tank consists of a cylindrical steel shell equipped with a roof that floats on the surface of the stored liquid.

**Internal Floating Roof Tank.** This type of tank has both a permanent fixed roof and a floating deck.

**Domed External Floating Roof.** This type of tank is typically an external floating roof tank that has been retrofit with a domed fixed roof.

## 4.2 Tank Information

Regardless of the tank type chosen, each tank should be identified by four data fields: identification number, city, state, and company. These four fields have no effect on emissions calculations.

**Identification Number.** This optional field allows the user to distinguish between different storage tanks using existing or user-assigned ID numbers. The tank identification number may be up to ten characters long and may consist of any combination of letters, numbers, symbols or spaces. Note that the program does not check for duplicate identification numbers, since it uses an internal system of record identification.

**Description.** This is an optional field in which comments or descriptive information may be entered about the tank.

**City.** This is an optional field used to identify the actual city in which the storage tank is located. This field does not determine ambient meteorological data. The city name may be up to 25 characters long, using letters, numbers, symbols and spaces in any combination. This may be different from the city chosen on the Site Selection screen as the source of meteorological data.

**State.** This is an optional field used to identify the State in which the tank is located. The two character postal abbreviation may be used, but numbers, letters or spaces are also acceptable. This may be different from the State chosen on the Site Selection screen as the source of meteorological data.

**Company.** This is an optional field used to identify the company which owns, uses, or has responsibility for the storage tank. The company name may be up to 30 characters long, including letters, numbers, symbols and spaces in any combination.

The remaining fields vary depending on the tank type chosen. Data entry for each type of tank is described below.

### 4.2.1 Vertical Fixed Roof Tank Information

There are 17 fields on the Vertical Fixed Roof Tank data entry screen, in addition to the identification information (see **Figure 4-2**).

**Shell Height.** This is the actual height of the tank in feet. This must be between 5 and 65 feet inclusive; values outside this range will not be accepted by the program.

**Diameter.** This is the width in feet of a vertical, cylindrical shell. This must be at least 5 feet.



**FIGURE 4-2**  
Vertical Fixed Roof Tank Data Entry Screen

```
TANKS Program 3.1                               September 9, 1995   10:54
+))))))) Vertical Fixed Roof Tank )))))),
*                                     Identification *
*   Identification No.: Example 1    Description: Sample Data *
*                   City: Denver      State: CO *
*                   Company: ACME Storage Tanks, Inc *
* **** Physical Characteristics **** *
*)))))))0)))))) *
* Dimensions * Roof Characteristics *
*     Shell Height (ft):          30.0 *
*           Diameter (ft):        20.0 * Color/Shade: White/White *
* Max. Liquid Height (ft):       25.0 * Condition: Good *
* Avg. Liquid Height (ft):       20.0 * Type: Cone *
* Working Volume (gal):          58758 * Height (ft): 2.000 *
* Turnovers per Year:            10.0 * Radius (ft) (Dome Roof): 0.00 *
* Net Throughput (gal/yr):       587580 * Slope (ft/ft) (Cone Roof): 0.20000 *
*)))))))3)))))) *
* Shell Characteristics * Breather Vent Settings *
* Is Tank Heated?: N * Vacuum Setting (psig): 0.00 *
* Shell Color/Shade: White/White * Pressure Setting (psig): 0.00 *
* Shell Condition: Good *
.)))))))-
<F1> Help <F2> Options <F8> Emissions Report <PgDn> Next Page
<Ctrl-End> Exit <F3> Copy <F9> Calculator
```

**Maximum Liquid Height.** This is the maximum height in feet of the liquid within the tank shell. This must be less than or equal to the shell height. The maximum liquid height is used to calculate the working volume for the tank and is used in the working loss equation, unless you elect not to use the calculated volume for the tank.

**Average Liquid Height.** This is the average height in feet of the liquid within the tank shell. This must be less than or equal to the maximum liquid height. The average liquid height is used in the standing storage loss calculations.

**Working Volume.** This is the working volume of the tank in gallons. The program will automatically calculate the tank volume based on the tank diameter and the maximum liquid height and display the result on the screen. You may use this estimate or provide a value for the volume. However, the program will display a warning message if the input tank volume is inconsistent with the tank diameter and maximum liquid height entered ( $\pi r^2(\text{max. ht.}) \cdot (7.48 \text{ gal./ft}^3)$ ).

If the working volume of the tank is measured in barrels, you may convert barrels to gallons by multiplying the number of barrels by 42. Press [F9] to access a calculator to assist in performing this function.

**Turnovers per Year.** This is the estimated number of times per year the tank is emptied and refilled. You may calculate the number of turnovers per year by dividing the

throughput by the tank volume. Also, you may enter zero to describe a tank in which the liquid was stored for an entire year. The program will still calculate breathing losses.

For surge tanks or constant level tanks, the number of turnovers calculated by dividing the throughput by the tank volume may be excessively high. In this case, the number of turnovers should be adjusted by multiplying by the average change in the liquid height in feet and dividing by the tank shell height. Enter this computed value as the turnover rate, or enter 4 as a default turnover rate. Then, adjust the net throughput by multiplying the adjusted turnovers by the working volume.

**Net Throughput.** This is the annual net throughput in gallons per year. If tank volume and the number of turnovers per year have been entered, the program will automatically calculate the net throughput and display this result on the screen; use this estimate or enter a different value for tank volume. To have the program calculate the throughput, press [F2].

If the net throughput of the tank is measured in barrels, you may convert barrels to gallons by multiplying the number of barrels by 42. Press [F9] to access a calculator to assist in performing this function.

**Is Tank Heated?** If the tank is heated, insulated, or otherwise regulated such that the ambient temperature conditions are not the sole factors that affect the surface temperature of the liquid, answer [Y]es to this question. When entering chemical data, you will be asked to provide the surface temperature (max., min. and avg.) and the bulk temperature of the liquid. Please note that if the max., min. and avg. liquid surface temperatures are the same, breather vent settings should be set at zero to avoid negative standing storage losses (see Vacuum and Pressure Setting below). In addition, if the tank is heated above 100° F, an option other than Option 1 should be completed in the chemical database (e.g., Antoine's coefficients).

**Shell Color/Shade.** This is the color and shade combination of the paint on the shell of the tank (i.e., the sides). To view the list of available options, press the [F2] key. The color/shade combination must be chosen from the available options. If the shell paint color does not appear on the list of options, choose the color/shade combination that most closely approximates it. If the shell color is unknown, use White/White as the default.

**Shell Condition.** This is the condition of the paint on the sides of the tank shell. To view the list of available options, press the [F2] key. If the shell paint condition is unknown, use Good as the default condition.

**Roof Color/Shade.** This is the color and shade combination of the paint on the roof. To view the list of available options, press the [F2] key. The color/shade combination must be chosen from this list, since these are the only combinations allowed by AP-42. If the color of the roof paint does not appear on the list of options, use the color/shade combination that most closely approximates it. If the roof color is unknown, use White/White as the default color.

**Roof Condition.** This is the condition of the paint on the tank roof. To view the list of available options, press the [F2] key. If the roof paint condition is unknown, use Good as the default condition.

**Roof Type.** The roof type may be either Dome or Cone. Display these options by pressing [F2].

**Roof Height.** This is the height of the tank roof in feet, not including the tank shell itself (the vertical distance from the top of the shell to the top of the roof). (See **Figure 4-3.**)

**Roof Radius.** This is the radius in feet of the arc of a domed roof. (See **Figure 4-3.**) This field is used only for tanks which have a dome roof, and will be disregarded for all cone roofs. The tank dome roof radius varies between a minimum of (0.8 x tank diameter) and a maximum of (1.2 x tank diameter). If the roof radius is not known, assume the dome roof radius is equivalent to the shell diameter.

**Roof Slope.** This is the slope of a cone roof in feet/feet. The program will calculate this value based on height and diameter values. This applies only if the roof is a cone, and will be disregarded by the program for domed roofs. Assume a value of 0.0625 ft/ft if the roof slope is unknown. (See **Figure 4-3.**)

**Vacuum Setting.** This is the storage tank vacuum setting in pounds per square inch gauge (psig). The vacuum setting must be between 0 and -1 psig. The program will automatically change the value of the number from positive to negative. The default vacuum setting is -0.03 psig. Press [F2] to display the default breather vent vacuum setting.

Note that the fixed roof tank emission estimation procedures do not apply to low- or high-pressure tanks.

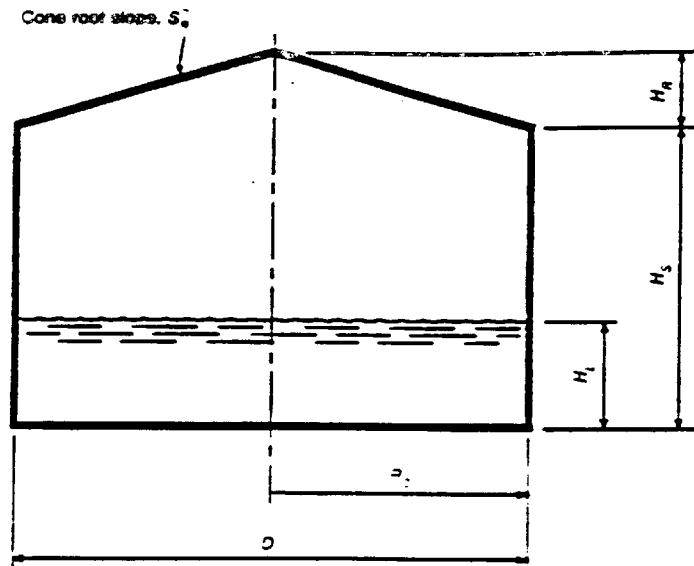
**Pressure Setting.** This is the storage tank pressure setting in pounds per square inch gauge (psig). The pressure setting must be between 0 and 1 psig. The default pressure setting is 0.03 psig. Press [F2] to display the default breather vent pressure setting.

Note that the fixed roof tank emission estimation procedures do not apply to low- or high-pressure tanks.

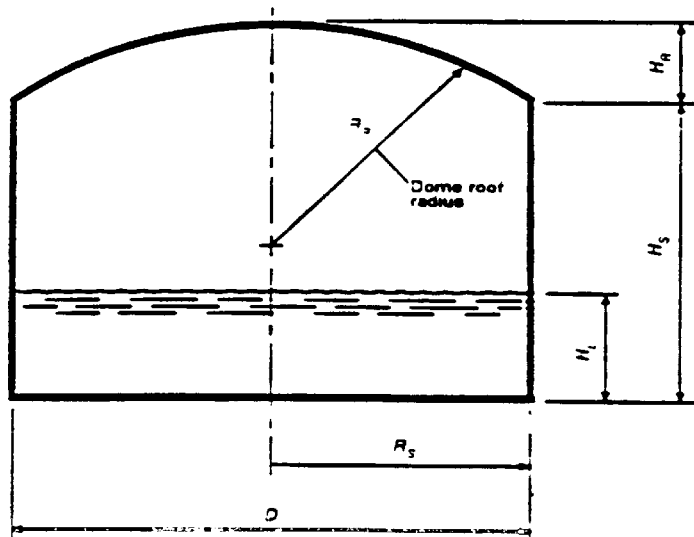
Note: for constant temperature tanks, the breather and pressure vent settings must be set to zero.

Please refer to **Section 4.3 Site Selection** below for instructions on entering the next page of data for this type of tank.

FIGURE 4-3  
Fixed Roof Slope and Radius



Cone roof



Dome roof

#### 4.2.2 Horizontal Fixed Roof Tank Information

There are ten fields on the Horizontal Fixed Roof Tank data entry screen, in addition to the identification information described above. (See **Figure 4-4.**)

**Shell Length.** This is the total length of the tank shell in feet. This must be between 5 and 75 feet; the program will not accept values outside this range. The length of the tank should be less than six times the diameter to ensure structural integrity.

**Diameter.** This is the width in feet of the cross section of the tank shell. This must be between 3 and 20 feet.

**Working Volume.** This is the working volume of the tank in gallons. This value must be supplied by the user for horizontal fixed roof tanks. Base the working volume on the maximum liquid height during the time period for which the emissions calculation is needed.

**FIGURE 4-4**  
Horizontal Fixed Roof Tank Data Entry Screen

```
TANKS Program 3.1                               September 9, 1995   10:22
+)))))) Horizontal Fixed Roof Tank )))))),
*                                     Identification *
*))))))) *
* Identification No.: Example 1 Description: Horizontal Fixed *
* City: Denver State: CO *
* Company: ACME Storage Tanks *
* **** Physical Characteristics **** *
*))))))) *
* Shell Length (ft): 20.0 *
* Diameter (ft): 7.0 *
* Working Volume (gal): 3000 *
* No. of Turnovers per Year: 5.2 *
* Net Throughput (gals/yr): 15600 *
* Is the tank underground (Y/N)? N Heated (Y/N)? N *
*))))))) *
* Paint Characteristics * Breather Vent Settings *
* * *
* Shell Color/Shade: White/White * Vacuum Setting (psig): -0.03 *
* Shell Condition: Good * Pressure Setting (psig): 0.03 *
* * *
.))))))) -
<F1> Help <F2> Options <F8> Emissions Report <PgDn> Next Page
<Ctrl-End> Exit <F3> Copy <F9> Calculator
```

If the working volume of the tank is measured in barrels, you may convert barrels to gallons by multiplying the number of barrels by 42. Press [F9] to access a calculator to assist in performing this function.

**Turnovers per Year.** This is the number of times per year the tank is emptied and refilled. Calculate the number of turnovers per year by dividing the throughput per year by the tank volume.

For surge tanks or constant level tanks, the number of turnovers calculated by dividing by the throughput may be excessively high. In this case, the number of turnovers should be determined by dividing the average change in the liquid height in feet by the tank shell height. Enter this computed value as the turnover rate, or enter 4 as a default turnover rate.

**Net Throughput.** This is the annual net throughput in gallons per year. If tank volume and the number of turnovers per year have been entered, the program will automatically calculate the net throughput; use this estimate or enter a different value for tank volume. Press [F2] to have the program calculate the throughput.

If the net throughput of the tank is measured in barrels, you may convert barrels to gallons by multiplying the number of barrels by 42. Press [F9] to access a calculator to assist in performing this function.

**Is the tank underground?** Answer "Y" if the tank is underground, "N" if it is not. Underground tanks are assumed to have no breathing losses, since the insulation of the earth limits the diurnal temperature change.

**Heated (Y/N)?** If the tank is heated or temperature controlled such that the ambient temperature conditions are not the sole factors affecting the surface temperature of the liquid stored in the tank, answer [Y]es to this question. When entering chemical data, you will be asked to provide the surface temperature (max, min and avg.) and the bulk temperature of the liquid. If the tank is heated above 100° F, an option other than Option 1 should be completed in the chemical database (e.g., Antoine's coefficients).

**Shell Color/Shade.** This is the color and shade combination of the paint on the shell of the tank (i.e. the sides). To view the list of available options, press the [F2] key. If the tank color does not appear on the list of options, choose the color/shade combination that most closely approximates it. If the tank color is unknown, use White/White as the default color.

**Shell Condition.** This is the condition of the paint on the sides of the tank shell. If the condition of the shell paint is unknown, use Good as the default condition.

**Vacuum Setting.** This is the storage tank vacuum setting in pounds per square inch gauge (psig). The vacuum setting must be between 0 and -1 psig. The program will automatically change the value of the number from positive to negative. Press [F2] to display the default breather vent vacuum setting. The default vacuum setting is -0.03 psig.

Note that the fixed roof tank emission estimation procedures do not apply to low- or high-pressure tanks.

**Pressure Setting.** This is the storage tank pressure setting in pounds per square inch gauge (psig). The pressure setting must be between 0 and 1 psig. Press [F2] to display the default breather vent pressure setting. The default pressure setting is 0.03 psig.

Note that the fixed roof tank emission estimation procedures do not apply to low- or high-pressure tanks.

Note: for constant temperature tanks, the breather and pressure vent settings must be set to zero.

Please refer to **Section 4.3 Site Selection** below for instructions on entering data for the next page for this type of tank.

#### **4.2.3 External Floating Roof Tank Information**

The information presented below applies to external floating roof tanks with and without domes. The difference between these two types, in terms of air emissions, is that wind speed is not a factor in estimating losses from domed external floating roof tanks. There are two data entry screens for external floating roof tanks. The first screen displays eleven fields, in addition to the identification information. (See **Figure 4-5.**) The second screen displays roof fitting information and is described below under **Section 4.2 Fitting Information**.

**Diameter.** This is the width in feet of the vertical, cylindrical shell.

**Tank Volume.** This is the working volume of the tank in gallons. You must supply this value for external floating roof tanks. Base the working volume on the maximum liquid height during the time period for which the emissions calculation is generated.

If the volume of the tank is measured in barrels, you may convert barrels to gallons by multiplying the number of barrels by 42. Press [F9] to access a calculator to assist in performing this function.

**Turnovers per Year.** This is the number of times per year the tank is emptied and refilled. Calculate the number of turnovers per year by dividing the throughput per year by the tank volume.

**Shell Condition.** This is the condition of the tank shell. If the shell condition is unknown, use Light Rust as the default condition.

**FIGURE 4-5**  
External Floating Roof Tank Data Entry Screen

```
TANKS Program 3.1                               September 9, 1995   10:24
+))))))) External Floating Roof Tank )))))),
*                                     Identification *
*   Identification No.: Example 2   Description: External Floating Roof *
*                   City: Denver           State: CO *
*                   Company: ACME Storage Tanks *
* **** Physical Characteristics **** *
* )))))))0) )))) *
* Tank Characteristics * Roof Characteristics *
*   Diameter (ft):      30.0 * *
* Tank Volume (gal):    500000 * Roof Type: Double Deck *
* Turnovers per Year:  10.0 * Fitting Category: Typical *
* Shell Condition: Light Rust * *
* Paint Color/Shade: White/White * *
* Paint Condition: Good * *
*)))))))2) )))) *
* Tank Construction and Rim-Seal System *
*   Tank Construction: Welded *
*   Primary Seal: Liquid-mounted *
*   Secondary Seal: Rim-mounted *
* *
.)))))))-
<F1> Help          <F2> Options        <F8> Emissions Report    <PgDn> Next Page
<Ctrl-End> Exit    <F3> Copy            <F9> Calculator
```

**Paint Color/Shade.** This is the color and shade combination of the paint on the shell of the tank (i.e. the sides). To view the list of available options, press the [F2] key. If the tank color does not appear on the list of options, choose the color/shade combination that most closely approximates it. If the tank color is not known, use White/White as the default color.

**Paint Condition.** This is the condition of the paint on the sides of the tank (the shell). If the paint condition is unknown, use Good as the default condition.

**Tank Construction.** Enter one of the two types of tank construction, either welded or riveted. Press [F2] to display these options; highlight the applicable type. Press [Enter] to select the type highlighted. If the type of tank construction is not known, use Welded as the default value.

**Primary Seal.** Primary seals close the annular space between the edge of the floating roof and the tank wall. There are three basic types of primary rim seals in use on external floating roof tanks: mechanical shoe, liquid mounted, and vapor

mounted. Note that the program assumes that all primary seals are average-fitting seals. If no specific information is available, use a mechanical shoe primary seal as the default value.



Mechanical shoe -- A metallic shoe seal.

Liquid mounted -- A resilient filled nonmetallic seal that is mounted in contact with the liquid in the tank.

Vapor mounted -- A resilient filled nonmetallic seal that is mounted a few inches above the liquid in the tank.

**Secondary Seal.** Options for the secondary seal field vary with the tank construction and primary seal type as follows:

Riveted tank options -- rim-mounted, shoe-mounted, or none

Welded tank options, mechanical shoe primary seals -- rim-mounted, shoe-mounted, or none

Welded tank options, resilient-filled seals (both liquid and vapor mounted) -- weather shield, rim-mounted, or none

Press [F2] to display these options; highlight the applicable type. Press [Enter] to select the type highlighted.

**Roof Type.** There are two types of external floating roofs: pontoon and double deck. Press [F2] to display these options; highlight the correct type. Press [Enter] to select the type highlighted.

**Fitting Category.** Choose the category that defines the roof fittings for this tank. Typical roof fittings are described in AP-42 Section 7.1. The specific fitting types will appear on the roof fitting screen, reached by pressing [Page Down]. This screen is described below.

Typical -- The program will use the type and number of fittings typical for the tank type. The status of the fittings will be typical of current practices.

Detail -- Select this category to specify the individual fittings on the tank if tank-specific data are available.

Please refer to **Section 4.2 Fitting Information** below to continue entering data for this type of tank.

#### 4.2.4 Internal Floating Roof Tank Information

As with external floating roof tanks, there are two data entry screens for internal floating roof tanks. The first screen displays 17 fields, in addition to the identification information (see **Figure 4-6**). The second screen contains deck fitting information and is described under **Section 4.2 Fitting Information** below.

**Diameter.** This is the width in feet of a vertical, cylindrical shell.



may be of either type. Tanks with columns have marginally higher emissions because of evaporation from the column surface area.

**Number of Columns.** This is the number of columns supporting the roof. The program will estimate the number of columns based on the tank diameter. Use this estimate or enter a different number. Recalculate the number of columns at any time by pressing [F2] while the highlight bar is on this field.

**Effective Column Diameter.** This is the average column diameter in feet. The column diameter is equal to 1.1 feet for 9 x 7 inch built-up columns, 0.8 feet for 8-inch diameter pipe columns. Press [F2] to select from these choices, or enter another value. Use 1.0 ft if no column construction details are known.

**Shell Condition.** This is the condition of the tank shell. If the shell condition is unknown, use Light Rust as the default condition.

**Shell Paint Color/Shade.** This is the color and shade combination of the paint on the shell of the tank (i.e. the sides). To view the list of available options, press the [F2] key. If the shell paint color does not appear on the list of options, choose the color/shade combination that most closely approximates it. If the shell paint color is unknown, use White/White as the default color.

**Shell Paint Condition.** This is the condition of the paint on the sides of the tank (the shell). If the shell paint condition is unknown, use Good as the default condition.

**Roof Color/Shade.** This is the color and shade combination of the paint on the roof. To view the list of available options, press the [F2] key. If the color of the tank roof does not appear, use the color/shade combination that most closely approximates it. If the roof color is unknown, use White/White as the default color.

**Roof Paint Condition.** This is the condition of the paint on the tank roof. To view the list of available options, press the [F2] key. If the roof paint condition is unknown, use Good as the default condition.

**Primary Seal.** Primary rim seals close the annular space between the edge of the floating roof and the tank wall. There are three basic types of rim seals in use on internal floating roof tanks, mechanical shoe, liquid mounted and vapor mounted. Both are resilient filled nonmetallic seals. Note that the program assumes that all primary seals are average-fitting seals. The program does not allow the calculation of emissions based on tight-fitting seals because of the difficulty in verifying the fit as the liquid height changes. If no specific information is available, assume a vapor-mounted primary seal is in use.

Mechanical Shoe Seal -- A metallic shoe seal.

Liquid Mounted -- A seal that is mounted in contact with the liquid in the tank.

Vapor Mounted -- A seal that is mounted a few inches above the liquid in the tank.

**Secondary Seal.** There are three options for secondary seals: rim-mounted, shoe mounted (when mechanical shoe seals are identified as primary seals), and none. Enter the appropriate selection.

**Deck Type.** There are two types of decks: bolted and welded. Press [F2] to display these options; highlight the correct type. Press [Enter] to select the type highlighted.

**Deck Fitting Category.** Choose whether the deck fittings for this tank are typical or require tank specific data entry. The Typical deck fittings for internal floating roof tanks are described in detail in AP-42 Section 7.1.

Typical -- The program will use the type and number of fittings typical for the tank type and deck defined on the previous screen. The status of the fittings will be typical of current practices.

Detail -- Select this category to specify the individual fittings on the tank if tank-specific data is available.

**Deck Construction.** This applies only to bolted decks. There are five options for deck construction (press [F2] to view these options):

Continuous sheet construction 5 feet wide -- Choose this as the default option if the deck construction is unknown.

Continuous sheet construction 6 feet wide

Continuous sheet construction 7 feet wide

Rectangular panel construction 5 x 7.5 feet

Rectangular panel construction 5 x 12 feet

**Deck Seam Length.** The length of the deck seams applies only to bolted decks. If the deck construction has been specified, the program will automatically calculate the deck seam length based on the deck construction and tank diameter. You may enter another value if desired.

#### 4.2.5 Domed External Floating Roof Tank Information

On the tank information screen, domed external floating roof tanks are treated the same as regular external floating roof tanks with the exception that wind speed is not a factor in calculating emissions from fittings and rim seals. Please refer to **Section 4.1.3 External Floating Roof Tank Information** above for information on each field.

### 4.3 Fitting Information

The second data entry screen for both internal and external floating roof tanks is the fittings screen. For external floating roof tanks, this screen is entitled Storage Tank Roof Fittings (see **Figure 4-7**); and, for internal floating roof tanks, this screen is entitled Storage Tank Deck Fittings. In either case, if the fitting category chosen on the first screen is

"Detail", then you must enter the fittings data. If the fitting category is "Typical," the roof fittings are automatically selected. If the typical fittings are modified, then the fitting category will be changed to "Detail."

**FIGURE 4-7**  
External Floating Roof Fittings Screen

```

TANKS Program 3.1                      September 9, 1995  10:41
+)))))))))) External Floating Roof Tank )))))))))),
*      +)))))))))) Storage Tank Roof Fittings: )))))))),
*      *      Fitting: Vacuum Breaker (10-in. Diam.)          *
*      *      Status: Weighted Mech. Actuation, Gask.         *
*      *      Quantity: 1                                     *
*      *      *      *      *      *      *      *      *
*      *      Fitting: Unslotted Guide-Pole Well              *
*      *      Status: Ungasketed Sliding Cover                *
*      *      Quantity: 1                                     *
*      *      *      *      *      *      *      *      *
*      *      Fitting: Roof Leg (3-in. Diameter)              *
*      *      Status: Adjustable, Center Area                 *
*      *      Quantity: 6                                     *
*      *      *      *      *      *      *      *      *
*      *      Fitting: Roof Drain (3-in. Diameter)            *
*      *      Status: Open                                    *
*      *      Quantity: 1                                     *
*      *      *      *      *      *      *      *      *
*      *      Fitting: Gauge-Hatch/Sample Well (8-in. Diam.) *
*      *      Status: Weighted Mech. Actuation, Gask.         *
*      *      *      *      *      *      *      *      *
*      *      .))))))))))-
*      *      .))))))))))-
<F1> Help      <F3> Copy Data      <F5> Delete Fitting      <F9> Change Status
<F2> Option    <F4> Add Fitting    <F8> Emissions Report  <F10> Factor

```

This screen has three fields for each roof fitting type on the tank: fitting, status, and quantity. The fitting field describes the general fitting type while the status field provides more specific information about the fitting and cover. The quantity indicates the number of fittings on the roof or deck. The fitting and status fields are automatically filled in when selected from the fittings database and cannot be edited.

Various function keys are available from this screen to perform the following tasks:

**[F2]** To have the program estimate the quantity of each fitting, press [F2], while the fitting is highlighted.

**[F3]** To copy tank and fitting data from another tank entry, press [F3], select a tank record, and select **Tank Data** from the menu entitled *Copy Tank Data*.

**[F4]** To view a list of all fitting types, press [F4]. Use the [ + ] and [ - ] keys to select and deselect fitting types and press enter to add the fittings to the tank record.

**[F5]** To delete a roof fitting type, move the highlight bar to the appropriate fitting and press [F5].

**[F9]** To change the status field for a particular fitting, highlight the fitting and press [F9] to view a list of alternative fitting status options. Highlight the desired record and press [Enter] to change the fitting status.

**[F10]** To view the calculated fitting loss factor for the combination of fittings listed, press [F10].

#### 4.4 Site Information

The Site Selection screen is identical for all five tank types (see **Figure 4-9**). To access the Site Selection screen after you have entered the Tank Information, press [PgDn].

Enter the nearest major city contained in the meteorological database on this screen. To display the list of cities in the database, press [F4]. To select a city from the list, move the highlight bar to the appropriate city and press [Enter].

If the tank's location is not included in the list of cities, it may be added to the list if all the meteorological data is available. Use the **Database Utilities** option on the *TANKS Main Menu* to add a new city to the meteorological database. (See **Section 6.2.1 Add Meteorological Data.**) After a city is selected, the screen displays the primary meteorological conditions for the selected site. These conditions include the daily average ambient temperature, the annual average minimum and maximum temperatures, the annual average wind speed, and the annual average solar insolation factor. These fields are display-only, and must be edited from the *Database Utilities* menu.

Modifying the meteorological data, or selecting a different city after entering information about the liquid stored in the tank, may affect the liquid information. The program will ask if the liquid information should be recalculated using any new data before moving to the next data entry screen. Press "Y" to update the liquid information.



Note: when changing this field from Single to Multiple, or vice versa, the program may erase other fields of liquid data after displaying a warning message.

Multiple-Component Liquid option is chosen, then the speciation field appears.



**Full Speciation.** Selecting this option means that you will provide the names of each chemical component (in the chemical database) and the concentration (percentage of total liquid weight). The program will then calculate the vapor pressure and other data for the entire mixture. After selecting Full Speciation, press [PgDn] to reach the Storage Tank Contents - Chemical Components Screen. See **Section 4.4.5 Multi-Component Liquid-Full Speciation** for options while using this screen.

The program uses Raoult's Law for calculating speciated estimates. These calculations assume that the mixture is homogenous and made up of components with similar true vapor pressures; they also assume that the mixture behaves ideally.

**Partial Speciation.** Selecting this option means that you will provide the chemical data (vapor pressure, molecular weight, vapor molecular weight, ... etc) for the entire mixture, and, that you will identify any chemical components (in the chemical database) for which an emissions estimate is required. For each component that you list and provide the concentration (% total weight), the report will calculate the air emissions for the chemical in addition to the total mixture.

You may select a mixture (e.g., crude oil) from the chemical database to have the program enter data for the mixture. However, if the mixture is a petroleum distillate or crude oil, you must enter the liquid molecular weight manually. If the mixture is an organic liquid, you must enter the vapor molecular weight manually.

**Vapor Weight Speciation.** Selecting this option means that you will provide the chemical data (vapor pressure, density, molecular weight, ...etc) for the entire mixture and that you will provide the percentage of total vapor weight for any other chemicals (in the chemical database) needed in an emissions report.

You may select a mixture (e.g., crude oil) from the chemical database to have the program enter data for the mixture. However, if the mixture is a petroleum distillate or crude oil, you must enter the liquid molecular weight manually. If the mixture is an organic liquid, you must enter the vapor molecular weight manually.

**None.** Selecting this option means that you will provide the chemical data for the entire mixture, but will not specify any chemical components. When using this option, you may not be able to obtain emissions estimates for individual components. Also, you may only obtain annual reports, rather than monthly reports, because the program lacks chemical data necessary to compute vapor pressures at various temperatures.

(If you wish to use a mixture from the database (e.g., crude oil) and do not want any component data, you may change the liquid to a single component liquid to allow monthly reporting.)

After selecting the type of liquid and speciation, you may enter annual data for the liquid, specify throughput volumes and chemicals/mixtures stored in the tank during various

months, or enter component information for any multi-component liquids. These options are described below for each component-speciation combination.

#### 4.5.2 Single Component Liquid

For a single-component liquid the Liquid Information screen (see **Figure 4-10**) contains fields for the chemical name, Chemical Abstract Service (CAS) number (optional), average liquid surface temperature, vapor pressure (psia) at liquid surface temperature, and liquid molecular weight. If the tank is heated, the screen will also contain entries for minimum and maximum liquid surface temperatures and bulk liquid temperature. Select a chemical or component name from the chemical database by pressing [F4]. The program will calculate or provide the remaining data using the chemical and meteorological databases.

Refer to the list of field definitions in **Section 4.5 Liquid/Component Information Data Fields** for instructions on completing or altering any field. In particular, please note that the liquid surface temperature field may be changed.

**FIGURE 4-10**  
Single Component Liquid Information Screen

[illegible]

#### 4.5.3 Multi-Component Liquid -- No Speciation (None)

For multiple-component liquids with the speciation designated as none, the Liquid Information Screen appears as shown in **Figure 4-11**. If the mixture is not in the chemical database, the program relies on you to provide all liquid data. Moreover, only annual reports may be generated with the Multiple-None selection because the program lacks the chemical data necessary to compute vapor pressures at different monthly temperatures for the mixture.

For floating roof tanks, the program does not require maximum and minimum temperature and vapor pressure values, therefore, these fields will not appear for external (including domed) and internal floating roof tanks. Heated fixed roof tanks require bulk temperature data in addition to the other fields shown in **Figure 4-11**. Refer to the list of field definitions in **Section 4.5 Liquid/Component Information Data Fields** for instructions on completing or altering any field.

**FIGURE 4-11**  
Multi-Component No Speciation -- Liquid Information Screen

[illegible]

#### 4.5.4 Multi-Component Liquid -- Partial Speciation

For multiple-component liquids with the speciation designated as partial, the Liquid Information Screen appears as shown in **Figure 4-12**. Press [F4] to select a mixture from the chemical database. If the mixture is not in the chemical database, the program relies on you to provide all liquid data for the entire mixture. However, you may identify various components of the mixture that are contained in the chemical database. Using this data, the program may compute emissions estimates for each component.

For floating roof tanks, the program does not require maximum and minimum temperature and vapor pressure values, therefore, these fields will not appear for external (including domed) and internal floating roof tanks. Heated fixed roof tanks require bulk temperature data in addition to the other fields shown in **Figure 4.13**. Refer to the list of field definitions in **Section 4.5 Liquid/Component Information Data Fields** for instructions on completing or altering any field.

## Multi-Component -- Partial Screen

[illegible]

Press [PgDn] to access the Chemical Components screen (see **Figure 4-13**). A list of chemicals in the database will appear. Use the [+] and [-] keys to select and de-select any components of the mixture. Once all components have been selected, press [Enter] to copy the chemical data to the Chemical Components Screen. For Multiple - Partial Speciation mixtures, you must provide the percentage of the total liquid weight of the mixture accounted for by the component.

**FIGURE 4-13**  
Storage Tank Contents -- Chemical Components Screen

```
TANKS Program 3.1                               September 9, 1995    11:42
+))))))) Vertical Fixed Roof Tank )))))),
*))))))) Storage Tank Contents - Chemical Components: ))))**,
**                                     Chemical: Benzene **
**           Percent of Total Liquid Weight:      88.68 **
**                                     Molecular Weight:      78.11 **
**           Average Liquid Surface Temperature (°F):  52.42 **
** Vapor Press. (psia) at Avg. Liq. Surf.Temp.:   0.942842073 **
**))))))) **
**                                     Chemical: Cyclohexane **
**           Percent of Total Liquid Weight:        3.19 **
**                                     Molecular Weight:     84.16 **
**           Average Liquid Surface Temperature (°F):  52.42 **
** Vapor Press. (psia) at Avg. Liq. Surf.Temp.:   0.982924252 **
**))))))) **
**                                     Chemical: Toluene **
**           Percent of Total Liquid Weight:        8.14 **
**                                     Molecular Weight:     92.13 **
**           Average Liquid Surface Temperature (°F):  52.42 **
** Vapor Press. (psia) at Avg. Liq. Surf.Temp.:   0.259604865 **
**))))))) **
*).)))))) - *
.))))))) -
<F1> Help          <F3> Copy Data       <F5> Delete Chemical
<F2> Weight/Weight %  <F4> Chemical List  <PgUp> Previous Page
```

#### 4.5.5 Multi-Component Liquid -- Vapor Weight Speciation

For multiple-component liquids with the speciation designated as vapor weight, the Liquid Information Screen appears as shown in **Figure 4-16**. Press [F4] to select a mixture from the chemical database. If the mixture is not in the chemical database, the program relies on you to provide all liquid data for the entire mixture. However, you may identify various components of the mixture that are contained in the chemical database. Using this data, the program may compute emissions estimates for each component.

For floating roof tanks, the program does not require maximum and minimum temperature and vapor pressure values, therefore, these fields will not appear for external floating roof tanks (including domed) and internal floating roof tanks. Heated fixed roof tanks require bulk temperature data in addition to the other fields shown in **Figure 4-14**. Refer to the list of field definitions in **Section 4.5 Liquid/Component Information Data Fields** for instructions on completing or altering any field.

**FIGURE 4-14**  
Multi-Component Vapor Weight Speciation

[illegible]

Press [PgDn] to access the Chemical Components screen (see **Figure 4-15**). A list of chemicals in the database will appear. Use the [+] and [-] keys to select and de-select any components of the mixture. Once all components have been selected, press [Enter] to copy the chemical data to the Chemical Components Screen. For Multiple - Vapor Weight Speciation mixtures, you must provide the liquid concentration (by weight) and the vapor concentration (by weight) for each component.

**FIGURE 4-15**  
Vapor Weight Speciation -- Chemical Components Screen

```

TANKS Program 3.1                      September 9, 1995  11:44
+)))))) Vertical Fixed Roof Tank )))))),
*+)))))) Storage Tank Contents - Chemical Components: )))))),*
**                               Chemical: Benzene                **
**      Percent of Total Liquid Weight:   88.68                  **
**      Percent of Total Vapor Weight:    80.00                  **
**      Molecular Weight:                 78.11                  **
**      Average Liquid Surface Temperature (°F): 52.42           **
** Vapor Press. (psia) at Avg. Liq. Surf.Temp.: 0.942842073     **
**)))))) )))) )))) )))) )))) )))) )))) )))) )))) )))) )))) )))) **
**                               Chemical: Cyclohexane            **
**      Percent of Total Liquid Weight:    3.19                  **
**      Percent of Total Vapor Weight:     3.00                  **
**      Molecular Weight:                 84.16                  **
**      Average Liquid Surface Temperature (°F): 52.42           **
** Vapor Press. (psia) at Avg. Liq. Surf.Temp.: 0.982924252     **
**)))))) )))) )))) )))) )))) )))) )))) )))) )))) )))) )))) )))) **
**                               Chemical: Toluene                **
**      Percent of Total Liquid Weight:    8.14                  **
**      Percent of Total Vapor Weight:    17.00                  **
**      Molecular Weight:                 92.13                  **
*.))))))) )))) )))) )))) )))) )))) )))) )))) )))) )))) )))) )))) - *
.))))))) )))) )))) )))) )))) )))) )))) )))) )))) )))) )))) )))) -
<F1> Help          <F3> Copy Data      <F5> Delete Chemical
<F2> Weight/Weight %  <F4> Chemical List  <PgUp> Previous Page

```

#### 4.5.6 Multi-Component Liquid -- Full Speciation

For multiple-component liquids with the speciation designated as full, the Liquid Information Screen appears as shown in **Figure 4-16**. This screen contains entries for mixture name, average liquid surface temperature, vapor pressure (psia) at liquid surface temperature, and liquid molecular weight. If the tank is heated, the screen will also contain entries for minimum and maximum liquid surface temperatures and bulk liquid temperature.



**FIGURE 4-16**  
Multi-Component -- Full Speciation

[illegible]

Press [F4] to enter a mixture from the chemical database. If the mixture is not in the chemical database, the program may use the chemical data for each component to calculate the properties of the entire liquid using Raoult's law. Therefore, you may wish to not enter any data into the liquid information screen until after entering the component data. Press [PgDn] to access the Chemical Components screen (see **Figure 4-17**). A list of chemicals in the database will appear. Use the [+] and [-] keys to select and de-select any components of the mixture. Once all components have been selected, press [Enter] to copy the chemical data to the Chemical Components screen.

For Multiple - Full Speciation mixtures, you must provide the liquid concentration (by weight) for every chemical in the mixture. In other words, the concentration percentages you enter must add up to 100 %. Rather than enter a % of total weight value, you may express concentration as weight/weight by pressing the [F2] key. Enter the relative liquid weight in pounds (e.g., 2 lbs. benzene to 1 lb xylene = 67% benzene and 33% xylene by weight).

Press [PgUp] to return to the liquid information screen. Where full speciation of a multi-component liquid is selected, the program will calculate the fields shown on the Liquid Information Screen after each component of the mixture has been specified. Refer to the list of field definitions in **Section 4.5 Liquid/Component Information Data Fields** for instructions on completing or altering any field.

**FIGURE 4-17**  
Chemical Components Data Entry

```

TANKS Program 3.1                      September 8, 1995 12:53
+)))))))))) Internal Floating Roof Tank )))))))))),
*+)))))))))) Storage Tank Contents - Chemical Components: )))))))),*
**                               Chemical: Acetic acid                **
**       Percent of Total Liquid Weight:  50.00                    **
**                               Molecular Weight:  60.05           **
**       Average Liquid Surface Temperature (°F):  64.02           **
**       Vapor Press. (psia) at Avg. Liq. Surf.Temp.:  0.193725204  **
**)))))))))) )))))))) )))))))) )))))))) )))))))) )))))))) )))))))) **
**                               Chemical: Acetic anhydride          **
**       Percent of Total Liquid Weight:  50.00                    **
**                               Molecular Weight:  102.09          **
**       Average Liquid Surface Temperature (°F):  64.02           **
**       Vapor Press. (psia) at Avg. Liq. Surf.Temp.:  0.062551277  **
**)))))))))) )))))))) )))))))) )))))))) )))))))) )))))))) )))))))) **
**                                                                    **
**                                                                    **
**                                                                    **
**                                                                    **
**                                                                    **
**                                                                    **
*.))))))))))) )))))))) )))))))) )))))))) )))))))) )))))))) )))))))) - *
.))))))))))) )))))))) )))))))) )))))))) )))))))) )))))))) )))))))) -
<F1> Help          <F3> Copy Data      <F5> Delete Chemical
<F2> Weight/Weight %  <F4> Chemical List  <PgUp> Previous Page

```

#### 4.6 Liquid/Component Information Data Fields

As mentioned above, the data fields that appear on the Liquid Information screen and the Chemical Component Screen depend on the tank type chosen, whether the tank is heated, the component designation (multiple or single), and the speciation option chosen. For single components and multi-component, fully speciated liquids, the program will calculate all required data. All of the possible data fields that may appear are described below. Please refer to this list for instructions on completing any field.

**Chemical Name.** Name of a chemical selected from the chemical database. To view a list of chemicals in the database, press [F4]; move the highlight bar to the desired chemical and press [Enter]. If the tank contains a chemical that is not included in the database, add that chemical using the Chemical Database option on the *Database Utilities* menu. (See **Section 6.0 Database Utilities.**)

**CAS Number.** The program will automatically fill this field in when a chemical is selected from the chemical list. The CAS number is an optional field and is not used in calculating emissions.

**Mixture Name.** Enter a descriptive name for the chemical or chemical mixture stored in the tank. If the mixture is available in the chemical database, you may select the data from the chemical database by pressing [F4].

**Average Liquid Surface Temperature.** The average surface temperature of the liquid in degrees Fahrenheit may be re-calculated anytime by pressing [F2]. For heated tanks, you must provide this value. In all cases, the average liquid surface temperature displayed is the annual average. However, the program will use monthly average liquid surface temperatures when monthly emission estimates are required.

You may enter a different value for the surface temperature within 20 °F of the calculated value (more for heated tanks). If the liquid surface temperature for a fixed roof tank is significantly different from that calculated based on the ambient temperature data, the average vapor pressure value will be re-calculated based on the new average surface temperature. In addition, the vapor pressure range will be calculated using the daily ambient temperature range (Max. - Min.) and the new surface temperature. If you wish to enter your own maximum and minimum surface temperatures and vapor pressures, change the liquid to a multi-component liquid with no speciation (Multiple - None). This will change the Liquid Information Screen to the screen shown in **Figure 4-11**, allowing you to enter specific ranges; however, you will lose the ability to run monthly reports.

**Minimum Liquid Surface Temperature.** Press [F2] to calculate the minimum liquid surface temperature in degrees Fahrenheit from the meteorological data. Press "Y" to enter the calculated value that the program displays, or press "N" to enter a different value. The program displays a warning message if the entered value is more than 20 percent different from the calculated value. This figure must be less than the average liquid surface temperature.

**Maximum Liquid Surface Temperature.** Press [F2] to calculate the maximum liquid surface temperature in degrees Fahrenheit from the meteorological data. Press "Y" to enter the calculated value that the program displays, or press "N" to enter a different value. The program displays a warning message if the entered value is more than 20 percent different from the calculated value. This figure must be greater than the average liquid surface temperature.

**Bulk Liquid Surface Temperature.** This field only appears when the tank is heated. The temperature of the bulk of the liquid is measured in degrees Fahrenheit.

**Vapor Pressure at Liquid Surface Temperature.** The average vapor pressure of the chemical should be given in pounds per square inch absolute (psia). Press [F2] to calculate the vapor pressure based on the average liquid surface temperature. Press "Y" to use the calculated value that is displayed. Press "N" to enter a different value.

**Minimum Vapor Pressure.** The minimum vapor pressure in pounds per square inch absolute (psia) is the vapor pressure of the mixture at the minimum liquid surface temperature.

**Maximum Vapor Pressure.** The maximum vapor pressure in pounds per square inch absolute (psia) is the vapor pressure of the mixture at the maximum liquid surface temperature.

**Liquid Molecular Weight.** The molecular weight of the component or mixture should be given in grams per mole. When a chemical from the chemical database is used, the

program provides this weight from the chemical database; in this case the field is a "read-only" field that cannot be edited.

**Liquid Density.** The liquid density of the mixture should be given in pounds per gallon at 60°F.

**Vapor Molecular Weight.** The molecular weight of the vapor should be given in grams per mole.

**Percent of Total Liquid Weight.** This field will appear on the Chemical Components Screen when the multi-component partial, vapor weight, or full speciation option is selected. Enter the liquid weight percentage of each component in this field. The sum of the percentages for all components must be less than or equal to 100 for partial or vapor weight speciation and equal to 100 for full speciation. This field must be filled in for each chemical component for which an emissions estimate is required.

For fully speciated liquids, you may press [F2] to display this field as "Relative Liquid Weight (Lbs)" described below.

**Relative Liquid Weight (Lbs).** This field will appear on the Chemical Components Screen when the multi-component full speciation option is selected. Press [F2] to toggle between displaying this field as "Percent of Total Liquid Weight" and "Relative Liquid Weight." Enter the relative liquid weight for each component (e.g., 2 lbs acetone for every 1 lb xylene). The program will convert the relative weights into percentages of total liquid weight for each component.

**Percent of Total Vapor Weight.** This field will appear on the Chemical Components Screen when the multi-component vapor weight speciation option is selected. Enter the vapor weight percentage of each component in this field. The sum of the percentages for all components must be less than or equal to 100. This field must be filled in for each chemical component for which an emissions estimate is required.

#### 4.7 Entering Monthly Data

Initially, the entire throughput volume entered for the tank, and the liquid information is assumed to apply to the entire year. However, it is possible to change the monthly throughput volumes and enter data for other chemicals or mixtures stored in the tank during the year. The Active Months window appears on the right hand side of the Liquid Information screen. Initially, the Active Months window shows the throughput for each calendar month as the total annual throughput (from the Tank Data Entry Screen) divided by 12. This default assumes that the same chemical mixture stays in the tank for the entire year, with the monthly throughput remaining constant. If the tank has a different monthly throughput from the default throughput listed, press [F9] while viewing the liquid information screen to access the Chemical Mixtures for Current Storage Tank window (see **Figure 4-18**). (Please note that this option is not available for a multi-component liquid with "None" entered for speciation.)

**FIGURE 4-18**  
Monthly Data Entry Screen

```

TANKS Program 3.1                      September 9, 1995  11:50
+)))))) Vertical Fixed Roof Tank )))))),
*
*      Storage Tank Contents -- Liquid Information
*))))))
* +)))))) Chemical Mixtures for Current Storage Tank )))))),
* *      Mixture Name:  Mixture for Example 1          *s )),*
* *      Active Months: J-F-M-A-M-J-J-A-S-O-N-D        *) **
* *      Throughput - January:      705                  * **
*) *      February:      705                  * **
* *      March:      705                  * **
* *      April:      705                  * **
* *      May:      705                  * **
* *      June:      705                  * **
* *      July:      705                  * **
* *      August:      705                  * **
* *      September:      705                  * **
* *      October:      705                  * **
* *      November:      705                  * **
* *      December:      705                  * **
*4*) )))))- *
* *                                     *n *
* . <F2> Months <F4> Chemical List <INS> Add <DEL> Delete <ESC> Exit )-ue. *
.) )))))-
<F1> Help      <F3> Copy      <F8> Emissions Report <PgUp>/<PgDn> Pages
<F2> Options   <F4> Chemical List <F9> Month Options

```

The following options are available to enter different throughput values and identify other mixtures and components stored in the tank:

**Mixture Name.** This field may be filled in based on entries made on the Liquid Information Screen. If not, enter a descriptive name for the first chemical mixture stored in the tank, or press [F4] to view a list of chemical components available from the database.

**Active Months.** Press [F2] to select the months in which the chemical mixture is stored in the tank. To select the active months, move the highlight bar to each month to be selected and press [+]. Selected records will appear highlighted and will be marked with an asterisk. Press [-] to de-select records. When all months have been selected, press [Enter].

**Throughput.** For each active month, enter the throughput in gallons for the liquid. For each month where there is no throughput for the tank, enter 0. If the throughput is measured in barrels, convert barrels to gallons by multiplying the number of barrels by 42.

**Insert.** To add a another chemical component or mixture, press [Ins]. Press [F4] to select another component from the list, or enter the name of the mixture in the Chemical Name field. Repeat the steps described above to specify the chemical/mixture

name, active months, and monthly throughput values. Repeat to add more entries. Be sure that the sum of all monthly throughput values equals the annual throughput for the tank.

**Delete.** To delete a chemical mixture from the Chemical Mixtures for Current Storage Tank window, use the Up/Down arrow keys to scroll the cursor into any field containing data for the Chemical Mixture that is to be deleted and press [Del]. The information in the Liquid Information Screen entered for that chemical mixture will also be deleted.

**Up, Down, PgUp, and PgDn.** Use these keys to view all of the chemical components or mixtures entered.

**Exit.** To return to the Liquid Information Screen, highlight the chemical or mixture that you wish to view, and press [Esc] or [Ctrl-End]. The Liquid Information Screen may contain the chemical data for that component if the data were entered previously; or you may have to enter new data if the component or mixture is new. To reach the liquid information screen for a chemical stored during a different portion of the year from the Liquid Information screen, press [F9] to view the month options, press [PgDn] or [PgUp] to find the desired chemical, and press [Esc] or [Ctrl-End].

#### 4.8 Editing Tank Records

To edit an existing tank record, select **Edit Existing Tank Record**, from the *Tank Records* menu. A list of tank records in the system will appear (see **Figure 4-19**). To change the list order, press [F2] and select the desired sort order for the tank records. Choose the appropriate tank by moving the highlight bar with the arrow keys and pressing [Enter] when the bar is on the correct tank. A series of data entry screens will appear. Existing data will appear in white. Enter or change data in the fields on these screens as described in **Section 4.1 Tank Information**.



**FIGURE 4-20**  
Deleting Storage Tank Records

```
TANKS Program 3.1                               September 9, 1995   11:59
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!+)))))) TANKS Main Menu ))))))),!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!*                                     +)))))) Tank Records ))))))),!!!!!!!!!!
!!!*    1. Overview                       *                                *!!!!!!!!!!!!
!!!*    2. Tank Records                   *    1. Add New Tank Record      *!!!!!!!!!!!!
!!!*    3. Generate Emissions Report     *    2. Edit Existing Tank Record *!!!!!!!!!!!!
!!!*    4. Database Utilities             *    3. Delete Existing Tank Record *!!!!!!!!!!!!
!!!*    5. System Utilities               *                                *!!!!!!!!!!!!
!!!*    6. Exit to DOS                    .))))))-!!!!!!!!!!!!
!!!*                                     *!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!+)))))) Delete Storage Tank Records ))))))),
!* ID No.         Company          City           State Type
!* 444444444444444444444444444444444444444444444444444444444444 More->*
!* Example 1 ACME Storage Tanks, Denver CO Vertical Fixed Roof *
!* Example 1 ACME Storage Tanks, Denver CO Horizontal Fixed Roof *
!* Example 2 ACME Storage Tanks, Denver CO Horizontal Fixed Roof *
!* Example 2 ACME Storage Tanks, Denver CO External Floating Roof *
!* Example 3 ACME Storage Tanks, Phoenix AZ External Floating Roof *
!* Example 3 ACME Storage Tanks, Denver CO Internal Floating Roof *
!* Example 4 ACME Storage Tanks, Birmingham AL Internal Floating Roof *
!* Example 4 ACME Storage Tanks, Denver CO Domed External Floatin *
!.)))))) <F1> Help  <+/-> Mark/Unmark  <Ret> Delete Marked Tanks )))))))-
<F1> Help
```



*[This page intentionally left blank.]*

## 5.0 GENERATING REPORTS

The TANKS 3.1 reporting feature is designed to provide you with emissions reports that contain as much or as little information as you desire. You may limit the report to only contain the total emissions for an entire year, or you may view every calculated emissions factor for every month of the year.

Reports may include emission estimates for the following types of loss: standing storage loss, working loss, withdrawal loss, rim seal loss, fitting loss, or deck seam loss. Consult AP-42 Section 7.1 for complete descriptions of these loss types and the emission estimating equations.

There are two ways to generate an emissions report using TANKS 3.1. You may use the **Generate Emissions Report** option on the *TANKS Main Menu* or you may run an emissions report while viewing a tank record (the **Tank Records** option). The advantage of using the **Generate Emissions Report** option is that you may generate reports for more than one tank at a time. The advantage of running reports from within the Tank Records data entry/edit screens is that you may immediately correct errors in the data.

From the *TANKS Main Menu*, select the **Generate Emissions Report** option to bring up the *Choose Reporting Period* window as shown in **Figure 5-1**.

OR

From within a tank record, press [F8] to generate a report after all data have been entered. The same window shown in **Figure 5-1** will appear with your tank data in the background.

[illegible]

The program may generate an emissions report for a one-year period or for selected months. For a one-year report, select **Annual Emissions Values**.

**FIGURE 5-2**  
Generate Emissions Report -- Month Selection

```

TANKS Program 3.1                               September 9, 1995   3:14
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!+)))))) TANKS Main Menu ))))))),!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!*                                     *!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!*  1. Overview                       *!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!*  2. Tank Records                   *!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!*  3. Generate Emissions Report      *!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!*  4. Database Utilities              *!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!*  5. System Utilities                *!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!*  6. Exit+)))))) Choose Reporting Period ))))))),!!!!!!!!!!!!!!!!!!!!
!!!*      *                             *!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!.)))))) *  1. Annual Emissions Values *!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!! *  2. Emissions Values for Selected Months *!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!! *                                     *!!!!!!!!!!!!!!!!!!!!!!
!!!!!!+)))))) Select Months ))))))),!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!*      Month                             *!!!!!!!!!!!!!!!!!!!!!!
!!!!!!* 44444444444444444444444444444444444444444444444444444444444444 *!!!!!!!!!!!!!!!!!!!!
!!!!!!*      January                         *!!!!!!!!!!!!!!!!!!!!!!
!!!!!!*      February                       *!!!!!!!!!!!!!!!!!!!!!!
!!!!!!*      March                         *!!!!!!!!!!!!!!!!!!!!!!
!!!!!!*      April                         *!!!!!!!!!!!!!!!!!!!!!!
!!!!!!*      May                           *!!!!!!!!!!!!!!!!!!!!!!
!!!!!!*      June                          *!!!!!!!!!!!!!!!!!!!!!!
      .)) <F1> Help  <+/-> Mark/Unmark  <Ret> Continue )))-
<F1> Help

```

## 5.2 Choosing the Level of Detail

After selecting a time period, the *Choose Report Type* menu will appear (see **Figure 5-3**). The following three levels of detail are available for the emissions report.

**FIGURE 5-3**  
Generate Emissions Report -- Level of Detail

```
TANKS Program 3.1                      September 9, 1995   3:15
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!+)))))) TANKS Main Menu ))))))),!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!*                                     *!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!* 1. Overview                         *!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!* 2. Tank Records                     *!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!* 3. Generate Emissions Report        *!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!* 4. Database Utilities                *!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!* 5. System Utilities                 *!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!* 6. Exit+)))))) Choose Reporting Period ))))))),!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!* *                                  *!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!.)))))) * 1. Annual Emissions Values *!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!! * 2. Emissions Values for Selected Months *!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!! * *!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!.))) +)) Choose Report Type )) ,)))))) - !!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!! * *!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!! * 1. Brief                   *!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!! * 2. Summary                 *!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!! * 3. Detail                  *!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!! * *!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!.)))))) - !!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!
!!!!!!!!!!!!
!!!!!!!!!!!!

<F1> Help
```

**Brief.** A brief report includes the date the report was run, tank identification information, and the standing, working, and total emissions in pounds. A breakdown by component will be included when using Full, Partial, or Vapor Weight Speciation.

**Summary.** In addition to the data in the brief report, the summary report contains specific information about the tank, including tank dimensions, paint, roof and deck characteristics, breather vent settings, tank construction descriptions, and the choice of roof or deck fitting options, if applicable. The summary report also includes liquid temperature and vapor pressure information and a table of emissions by chemical component for each type of loss mechanism and for total losses.

**Detail.** In addition to the data presented in the summary report, the detail report includes all values calculated during report generation, grouped by loss category. These values include liquid temperatures, paint factors, vapor pressures, chemical data, fitting factors, and other constants. Data are provided for each month selected and for each chemical component.

Highlight the desired level of detail and press [Enter] to continue.

### 5.3 Choosing the Tank

When an emissions report is being generated from the *TANKS Main Menu*, a list of storage tanks from which to select will appear. (If generating a report within a tank record, this step does not apply.) To generate a report for a single tank, move the highlight bar to that tank on the list and press [Enter] to generate the report.

To generate a "batch" of reports for several tanks, use the [+] and [-] keys to select or de-select two or more tanks. Selected tanks will appear highlighted and will be marked with an asterisk. After selecting the desired tanks, press [Enter] to generate reports for them.

The batch report feature makes it possible to generate reports for all tanks in the system or for a subset of tanks (for example, all tanks in a certain location). Press [F2] to rearrange the order in which the tanks are listed.

#### 5.4 Viewing and Printing Reports

When a report is generated, the program will always display it on the screen before any printing is done. Choose from the following options while the report is in View Report Screen:

**Arrow Keys.** Move up, down and across the report.

**[F1]** Go to the Help system.

**[F2]** Print the entire report.

**[F3]** Print selected pages from the report.

**[F5]** Pressing the [F5] key while viewing an air emissions report exports the data used to generate the report or the report itself to a file. As shown in **Figure 5-4**, TANKS 3.1 offers you fourteen different formats in which to export the report or emissions data. The first two options (ASCII Text and Printer-Ready) will export the report exactly as it is shown on your screen. The ASCII text file may be merged into other documents or edited. The Printer-Ready file includes printer initialization codes enabling you to send the file to your printer.

The remaining 12 options export the data used to generate the report. In TANKS 3.1, the data are stored in the file EMISSION.DBF located in the TANKS3 system data directory (default location C:\TANKS\DATA). Upon selecting an export option, you may convert this file into a format that may be read by the software listed in **Figure 5-4**. You will be given an opportunity to specify the new file name and path. Please consult Appendix A: Data Dictionary for a complete list of the data elements contained in EMISSION.DBF, and therefore, your exported file.

**[Esc]** Return to the previous window.

**FIGURE 5-4**  
Exporting Emissions Report and/or Data

```

TANKS Program 3.1                               September 9, 1995   3:14
+)))))))))) View Report ))))))))),
*
*          +)))))) Export File ))))))),.0
*          *
*          * ASCII Text          TXT  *
*          * Printer-Ready       PRT  *
*          * ASCII SDF           TXT  *
*          * ASCII Comma-Delimited TXT  *
* Annual Emissions Re* FoxPro/dBase  DBF  *
* Example 4 Internal* VisiCalc      DIF  *
*          * Multiplan 4.01       MOD  *
*          * MultiPlan           SLK  * Emissions (lbs.)
*          * Lotus 1-2-3 2.x      WK1  * -----
*          * Lotus 1-2-3 1-A      WKS  *
*          * Symphony 1.10        WR1  *          948.87
*          * Symphony 1.0         WRK  *
*          * Excel                XLS  *          120.29
* Total:          * Word Perfect Mail Merge WP  *          1069.16
*          *
*          .))))))-
*
*
*
.)))))) [F2]-Print All [F3]-Print Selected Pages [F5]-Export ))))))-

```

## 5.5 Errors/Incomplete Data Reports

Sometimes errors or blank fields in the data will prevent report generation. The program will display an error message during data entry if data problems are serious enough to make an emissions calculation impossible. See **Appendix B, Error Messages** for a complete list of error messages and suggested resolutions. Correct errors and/or fill the blank fields before attempting to generate another report.

The program may also display warnings of problems that will not prevent report generation, but may indicate incorrect or implausible data. In some cases, the program may detect data errors during report generation. These run-time errors usually involve conflicting chemical and tank data. When these errors occur, informative messages describing the source of the problem are displayed on the report.

## 5.6 Report Content

There are two types of information in an emissions report: tank data and the emissions calculations.

The tank data included in the reports are a restatement of information already entered about the tank, and may include identification, tank characteristics and description, site information, and information about the chemicals that make up the liquid in the tank.

The program calculates the emissions based on the tank data, meteorological and chemical data, and equations from AP-42 Section 7.1, Organic Liquid Storage Tanks.

Depending on the type of tank and the level of detail chosen, the report may distinguish between different chemical loss categories, including standing losses, withdrawal losses, roof or deck fitting losses, rim-seal losses and deck-seam losses. Standing losses (also called storage or breathing losses) occur when the liquid expands and contracts due to changes in ambient temperature or barometric pressure. Withdrawal losses occur when the tank is emptied or filled. Roof or deck fitting losses result from leaks through the various types of floating roof fittings. Rim-seal losses are evaporative losses from the tank's rim seals. Deck-seam losses occur as a result of the welds or joints in the deck seams. (See AP-42 Section 7.1.)

If Full, Partial, or Vapor Weight Speciation is used for a multi-component liquid, the reports provide a breakdown of emissions by chemical component.



*[This page intentionally left blank.]*

## 6.0 DATABASE UTILITIES

The **Database Utilities** option on the *TANKS Main Menu* allows you to edit or add information to the system databases, perform various data maintenance tasks, and manipulate (copy, archive, backup, import, or merge) your tank and/or system data. To use the Database Utilities effectively, you should understand the basic structure of the TANKS 3.1 data system.

The core of the TANKS 3.1 system data is comprised of four databases containing various factors required to estimate air emissions from storage tanks. The system databases are located in the data directory (default location C:\TANKS3\DATA). These are described below.

These databases may be altered outside of the TANKS 3.1 system using a dBase compatible software package; however, this may compromise your ability to use the data from within TANKS 3.1. Therefore, it is not recommended that you edit these databases outside of TANKS 3.1. Moreover, you may check each database to ensure that they have not been altered using the **Verify Data Integrity** options included in Database Utilities.

**Chemical Database.** The chemical database (chemical.dbf) consists of data for various organic chemicals, petroleum liquids, and crude oils necessary to calculate vapor pressures at any ambient temperature.

**Meteorological Database.** The meteorological database (cities.dbf) consists of a list of cities along with meteorological data needed to estimate emissions resulting from heating and cooling of tanks by ambient conditions, wind losses, and barometric pressure changes.

**Fitting Factor Database.** The fitting factor database (fit\_tbl.dbf) contains a list of common tank roof and deck fittings (e.g., access hatches) along with loss factors needed to calculate losses from leaks in roofs and decks.

**Rim Seal Database.** The rim seal database (rim\_seal.dbf) contains a list of common primary and secondary rim seals along with loss factors necessary to calculate losses from rim seals.

These databases are used during data entry to input data into each tank record. The tank records are stored in four analogous "tank" databases described below. These database records are linked by an internal tank id, created during data entry. The tank data are located in the TANKDATA directory (default location C:\TANKS3\TANKDATA).

**Fittings.** The fitting database (fittings.dbf) contains fitting data selected from the fitting factor database or entered by the user for each tank.

**Mixture.** The mixture database (mixture.dbf) contains information about liquid mixtures in the storage tank such as the active months and the speciation options selected by the user during data entry.

**Storage.** The storage database (storage.dbf) contains information on individual components stored in each tank.



1. Estimating Air Toxics Emissions From Organic Liquid Storage Tanks, EPA-450/4-88-004, U.S. Environmental Protection Agency, Research Triangle Park, NC, October 1988.
2. Henry C. Barnett, et al., Properties of Aircraft Fuels, NACA-TN 3276, Lewis Flight Propulsion Laboratory, Cleveland, OH, August 1956.
3. Petrochemical Evaporation Loss from Storage Tanks, First Edition, Bulletin No. 2523, American Petroleum Institute, Washington, DC, 1969.
4. SIMMS Data Base Management System, U.S. Environmental Protection Agency, Research Triangle Park, NC.

To add, edit, modify, or print information in the chemical database, select the **Chemical Database** option to reach the *Modify Chemical Database* menu (see **Figure 6-2**).

[illegible]

### 6.1.1 Add Chemical Data

H. H. ... A. H. ... M. H. ...

**FIGURE 6-3**  
Chemical Information Screen

```

+)))))))))) Chemical Information ))))))))*,
* Chemical Name:                               CAS Number: *
* Category:                               Liq.Mol. Weight: 0.00 *
* Liquid Density at 60°F (lbs/gal): 0.000 Vap. Mol. Weight: 0.00 *
*)))))))))) *
* Vapor Pressure Information (fill in one or more options completely) *
*)))))))))) *
* Option 1: Enter Vapor Pressure (psia) for each temperature: *
* 40°F: 0.000000000 80°F: 0.000000000 *
* 50°F: 0.000000000 90°F: 0.000000000 *
* 60°F: 0.000000000 100°F: 0.000000000 *
* 70°F: 0.000000000 *
*)))))))))) *
* Option 2: Constants for Antoine's Equation (using °C): *
* A: 0.0000 B: 0.000 C: 0.000 *
*)))))))))) *
* Option 3: Constants for Antoine's Equation (using °K): *
* A: 0.000 B: 0.0000 *
*)))))))))) *
* Option 4: Reid Vapor Pressure (psia): N/A (Distillates, Crude Oil) *
* ASTM Slope: N/A (Distillates only) *
.))))))))))) -
<F1> Help <F2> Options
<Ctrl-End> Save and Exit

```

The chemical name, category, molecular weight, liquid density, and one of the four Vapor Pressure Information options must be filled in. Incomplete records will not be added to the chemical database.

**Chemical Name.** Enter the name of the chemical in this field. The name may be up to 30 characters long and consist of letters, numbers, symbols and spaces in any combination. Although not required, it is best to avoid duplicating the name of another chemical in the database exactly.

**CAS Number.** Enter the chemical abstract service number for the chemical. This is an optional field.

**Category.** There are three chemical categories: crude oils, petroleum distillates and organic liquids.

Crude oils are unrefined petroleum stocks. Petroleum distillates include refined petroleum stocks, jet fuels, gasoline and distillate fuels. Organic liquids include all other organic compounds.

Press [F2] to display a table with these options; highlight the correct type. Press [Enter] to select the type highlighted.

**Vapor Molecular Weight.** Enter the vapor molecular weight of the chemical (for single component liquids, the liquid molecular weight is equal to the vapor molecular weight).

**Liquid Molecular Weight.** Enter the liquid molecular weight of the chemical.

**Liquid Density at 60°F.** Enter the liquid density of the chemical in pounds per gallon.

**Vapor Pressure Information:** One of the four Vapor Pressure Information options must be filled out completely.

**Option 1: Vapor Pressures.** Enter the vapor pressure in pounds per square inch absolute at each of seven listed temperatures. All seven temperatures must be filled in.

**Option 2: Antoine's Equation (using °C).** Enter A, B and C, the constants in Antoine's Equation:

$$\log_{10}(P) = A - \frac{B}{T + C}$$

where:

$$P = \text{vapor pressure, mmHg}$$
$$T = \text{temperature, } ^\circ\text{C}$$

**Option 3: Antoine's Equation (using °K).** Enter A and B for the following form of Antoine's Equation:

$$\log_{10}(P) = \frac{-0.05223 A}{T} + B$$

where:

$$P = \text{vapor pressure, mmHg}$$
$$T = \text{temperature, } ^\circ\text{K}$$

**Option 4: Reid Vapor Pressure and ASTM Slope.** This option applies only to petroleum distillates and crude oils.

**Reid Vapor Pressure.** Enter the Reid vapor pressure in pounds per square inch absolute (psia).

**ASTM Slope.** This field applies only to petroleum distillates. The ASTM slope is the slope of the ASTM-D86 distillation data at 10 volume percent evaporated and may be calculated from the distillation data:

$$S = \frac{T(15) - T(5)}{10}$$

where:

*S = Stock ASTM-D86 Distillation Slope at 10 volume percent evaporated, °F per volume percent*

*T(5) = temperature at which 5 volume percent is evaporated, °F*

*T(15) = temperature at which 15 volume percent is evaporated, °F*

Press [Ctrl-End] to save and exit. Press [Esc] to exit without saving.

#### 6.1.2 View/Edit Chemical Data

To view or edit existing chemical data, select the **View/Edit Chemical** option from the *Modify Chemical Database* menu. Pressing the first letter of a chemical will cause the highlight bar to leap to that entry. You may change the display order of the chemicals to CAS number by pressing the [F2] key. Move the highlight bar to the chemical to be viewed or modified and press [Enter] (see **Figure 6-4**). The Chemical Information screen will appear with data that has already been entered. This is the same screen described under Add Chemical Data (see **Figure 6-3**). Correct data by moving the highlight bar to the appropriate field with the [Enter], [Tab] or arrow keys and enter the correct data.

When editing of chemical data is complete, the chemical name, chemical category, molecular weight and liquid density at 60°F fields must contain data. Completion of one of the four Vapor Pressure Information options is also required. (The CAS number field is optional.) Incomplete records will not be saved in the chemical database. Press [Ctrl-End] to save and exit. Press [Esc] to exit without saving change. **Note: You cannot edit chemical data included with the program; only user-added chemicals may be modified.**





**FIGURE 6-5**  
Modify Chemical Database Menu -- Delete Chemical

[illegible]

#### 6.1.4 Print Chemical Data

Use this option to print a report displaying the data for one or more chemicals in the chemical database. When this option is selected, the Select Chemicals to Print screen will appear (see **Figure 6-6**). Position the highlight bar over each chemical to print. Use the [+ ] and [- ] keys to select and de-select chemicals for printing. Selected records will appear highlighted and will be marked with an asterisk. Press [Enter] to print the information on all the selected chemicals. TANKS 3.1 will generate a report on-screen prior to any actual printing. Use the arrow keys, [PgDn], [PgUp], [End], and [Home] keys to view the report. Press [F2] to print the report, [F3] to print selected pages, and [F5] to export the report to a file.

**FIGURE 6-6**  
Modify Chemical Database Menu -- Print Chemical Data

```
TANKS Program 3.1                               September 9, 1995   5:22
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!+)))))) TANKS Main Menu ))))))),!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!*                                     +)))) Database Utilities ))))))),!!!!!!!!
!!!*    1. Overview                       *                                *!!!!!!!!!
!!!*    2. Tank Records                   *    1. Chemical Database          *!!!!!!!!!
!!!+)))))))))))))))) Select Chemicals to Print ))))))))))))))))))),!!!
!!!*      Chemical Name                    CAS No.   Vapor Press. at 60°F (psia) *!!!
!!!*444444444444444444444444444444444444444444444444444444444444444444444444*!!!
!!!* * Acetic anhydride                     00108-24-7       0.0534             *!!!
!!!* * Acetone                             00067-64-1        2.8620             *!!!
!!!* * Acetonitrile                        00075-05-8         1.0830             *!!!
!!!* * Acrylamide                          00079-06-1         0.0001             *!!!
!!!* Acrylic acid                           00079-10-7         1.3436             *!!!
!!!* Acrylonitrile                         00107-13-1         1.3730             *!!!
!!!. <F1> Help  <F2> Order  <+/-> Mark/Unmark  <Ret> Print Marked Chemicals )-!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!*    1. Add Chemical                      *!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!*    2. View/Edit Chemical                 *!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!*    3. Delete Chemical                   *!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!*    4. Print Chemical Data               *!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!*                                         *!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!*                                         *!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!*.))))))))))))))))))))))))))))))))))-!!!!!!!!!!!!!!!!!!!!!!!!!!!!

<F1> Help
```

## 6.2 Meteorological Database

The meteorological database contains technical weather data such as temperatures, wind speed, and solar insolation factors for a specific city or location. If errors are found in the original data, EPA will identify them in announcements on the CHIEF bulletin board.

The sources of the meteorological data used in TANKS 3.1 include the following:

1. Comparative Climatic Data Through 1991, National Oceanic and Atmospheric Administration, Asheville, NC, 1991.
2. Input for Solar Systems, Prepared by U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Environmental and Information Service, National Climatic Center, Asheville, NC. Prepared for the U.S. Department of Energy, Division of Solar Technology, November 1987 (revised August 1979).

The meteorological database contains several cities where some data were unavailable. Any missing data for those cities was filled in using data from nearby locations. Appendix C contains a list of these cities and the data elements that have been filled in with alternative data.

Select **Meteorological Database** option from the *Database Utilities* menu to add, edit, view, print or delete meteorological data (see **Figure 6-7**).

**FIGURE 6-7**  
Modify Meteorological Database Menu

```

TANKS Program 3.1                               September 9, 1995    5:25
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!+)))))) TANKS Main Menu ))))))),!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!*                                     +)))))) Database Utilities ))))))),!!!!!!!!!!!!
!!!* 1. Overview                         *                               *!!!!!!!!!!!!
!!!* 2. Tank Records                     * 1. Chemical Database         *!!!!!!!!!!!!
!!!* 3. Generate Emissions Report        * 2. Meteorological Database      *!!!!!!!!!!!!
!!!* 4. Database Utilities                * 3. Roof Fittings                *!!!!!!!!!!!!
!!!* 5. System Utilities                  * 4. Rim Seals                    *!!!!!!!!!!!!
!!!* 6. Exit to DOS                       * 5. Reindex Databases            *!!!!!!!!!!!!
!!!*                                     * 6. Switch Data Directory        *!!!!!!!!!!!!
!!!*                                     * 7. Import/Export TANKS Data     *!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!! * 8. Backup/Restore from Backup    *!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!! * 9. Merge Data Directories       *!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!! *!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!.))))+)))) Modify Meteorological Data ))))*,
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!*
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!* 1. Add Meteorological Data        *
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!* 2. View/Edit Meteorological Data   *
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!* 3. Delete Meteorological Data      *
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!* 4. Print Meteorological Data       *
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!*
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!*
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!.))))))))))))))))))))))))))))))))))))-
<F1> Help

```

### 6.2.1 Add Meteorological Data

To add meteorological data for a new city, select the **Add Meteorological Data** option from the *Modify Meteorological Data* menu. The Site Meteorological Data screen will appear (see **Figure 6-8**). Enter data in every field on this screen; incomplete records will not be added to the meteorological database.

**City.** Enter the name of the city or site in this field. The name may be up to 20 characters long and consist of letters, numbers, symbols and spaces in any combination.

**State.** Enter the name of the state where the city or site is located in this field. The state name may be up to 15 characters long and consist of letters, numbers, symbols and spaces in any combination.

**FIGURE 6-8**  
Modify Meteorological Database Menu -- Add Meteorological Data

```

TANKS Program 3.1                               September 9, 1995   5:27
+) Site Meteorological Data )),
* City:                               State:                               State Abbrev.:          *
* Daily Average Ambient Temperature (°F): 0.00   Atmos. Press. (psia): 0.00   *
*)                               *
*                               Daily Ambient Temp. (°F)   Solar Insolation Factor   Avg. Wind
*                               Minimum           Maximum           (BTU/(ft·ft·day))       Speed (MPH)
*
* January:           0.00           0.00           0           0.0
* February:          0.00           0.00           0           0.0
* March:             0.00           0.00           0           0.0
* April:            0.00           0.00           0           0.0
* May:              0.00           0.00           0           0.0
* June:             0.00           0.00           0           0.0
* July:            0.00           0.00           0           0.0
* August:           0.00           0.00           0           0.0
* September:        0.00           0.00           0           0.0
* October:          0.00           0.00           0           0.0
* November:         0.00           0.00           0           0.0
* December:         0.00           0.00           0           0.0
*
* Annual:           0.00           0.00           0           0.0
.) -
<F1> Help
<Ctrl-End> Save and Exit

```

**State Abbreviation.** Enter the two-letter postal abbreviation for the state where the site is located in this field.

**Annual Average Ambient Temperature.** Enter the annual ambient average temperature in degrees Fahrenheit (°F) for this site in this field.

**Atmospheric Pressure.** Enter the annual atmospheric pressure average in pounds per square inch absolute (psia). The default setting for other cities in the database is 14.7 psia. The pressure must be between 11.0 and 19.0 psia.

**Daily Minimum Ambient Temperature.** There are thirteen daily minimum ambient temperature fields: one for each of the twelve months and one for the annual daily minimum ambient temperature. Enter the daily minimum ambient temperature for each month and for the year at the site.

**Daily Maximum Ambient Temperature.** There are thirteen daily maximum ambient temperature fields: one for each of the twelve months and one for the annual daily maximum ambient temperature. Enter the daily maximum ambient temperature for each month and for the year at the site.

**Solar Insolation Factor.** There are thirteen solar insolation factor fields: one for each of the twelve months and one for the annual solar insolation factor. Enter the solar insolation factor in BTU per square foot per day (BTU/ft.ft.day) for each month and for the year at the site. The solar insolation factor is a measure of the intensity of solar energy at a given location.

**Average Wind speed.** There are thirteen average Wind speed fields: one for each of the twelve months and one for the annual average Wind speed. Enter the average Wind speed in miles per hour for each month and for the year at the site.

### 6.2.2 View/Edit Meteorological Data

To view or edit an existing city's data, select the **View/Edit Meteorological Data** option from the *Modify Meteorological Data* menu. The program will display the Select Site to View/Edit screen (see **Figure 6-9**). Move the highlight bar to the desired city and press [Enter]. The Site Meteorological Data screen for that city will appear; data already entered will appear in white. This is the same screen described under Add Meteorological Data, above (see **Figure 6-8**).

For cities provided with the program, only the atmospheric pressure field may be altered. The pressure must be between 11.0 and 19.0 psia. Warning: altering this field will affect the tank data already entered into the database for this city. When editing user-supplied meteorological data, make sure that **every** field on the screen is filled out. Incomplete records will not be added to the meteorological database. Press [Ctrl-End] to save and exit. Press [Esc] to exit without saving.

To delete one or more cities from the database, select the **Delete Meteorological Data** option from the *Modify Meteorological Data* menu. The program will display a list of the cities in the Meteorological Database (see **Figure 6-10**). Position the highlight bar over each city to delete. Use the [ + ] and [ - ] keys to select and de-select records for deletion. Selected records will appear highlighted and will be marked with an asterisk. Press [Enter] to delete all the selected cities. Although allowed, deleting the existing meteorological data provided with

the program is strongly discouraged. Use this option only to erase user-entered cities or sites.

**FIGURE 6-10**  
Modify Meteorological Database Menu -- Delete Meteorological Data

[illegible]

#### 6.2.4 Print Meteorological Data

To print meteorological data for one or more cities, select the **Print Meteorological Data** option from the *Modify Meteorological Data* menu. The program will display a list of the cities in the meteorological database (see **Figure 6-11**). Position the highlight bar over each city to print. Use the **[+]** and **[-]** keys to select and de-select cities for printing. Selected records will appear highlighted and will be marked with an asterisk. Press **[Enter]** to print the information on all the selected cities. The system will print all data that has been entered into the database on each city selected.

TANKS 3.1 will print the report to your screen. Press [F2] to print the report, [F3] to print selected pages, and [F5] to export the report to a file. Press [Esc] to exit without printing.





**FIGURE 6-12**  
Modifying Fitting Database

[illegible]

### 6.3.1 Add Roof Fitting Data

To add new records to the roof fitting database, select **Add Fitting** from the *Modify Roof Fitting Database* menu. The program will display the Fitting Factor Information screen as shown in **Figure 6-13**. Fill in each field as described below.

**Fitting Type.** Enter the name of the fitting type (e.g., Access Hatch (24-in. Diameter)).

**Status.** Enter information about the cover of the fitting (e.g., Unbolted cover, Gasketed).

**Loss Factors.** Enter the loss factors for K-fa, K-fb and M. These factors are described in more detail in AP 42, Section 7.1 and a table of roof fitting factors is provided in Table 7.1-11 of AP 42. These factors are used in the following formula:

$$K_F = K_{Fa} + K_{Fb} (K_v V)^M$$

where:

$K_F$  is the total fitting loss factor (lb-mole/yr)

$K_{Fa}$  is the non-wind dependent loss factor (lb-mole/yr)  
 $K_{Fb}$  is the wind dependent loss factor (lb-mole/(mpg)<sup>M</sup>yr)  
 $K_v$  is the fitting wind speed correction factor (dimensionless;  $K_v = 0.7$ )  
 $V$  is the average wind speed (mph)  
 $M$  is the wind speed exponent factor (dimensionless)

**Default Quantity.** Enter the typical number of fittings in a roof or deck. This number will be entered into the tank record when the roof fitting is selected, but may be edited from the tank data entry screens.

Press [Ctrl-End] to save and exit. Press [Esc] to exit without saving.

**FIGURE 6-13**  
Adding New Fitting Data

```

TANKS Program 3.1                               September 9, 1995  12:56
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!+)))))) TANKS Main Menu ))))))),!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!*                                     +)))))) Database Utilities ))))))),!!!!!!!!!!!!!!!!
!!!* 1. Overview                               *                               *!!!!!!!!!!!!!!
!!!* 2. Tank Records                           * 1. Chemical Database           *!!!!!!!!!!!!!!
!!!* 3. G+)))))) Fitting Factor Information )))))))) , *!!!!!!!!!!!!!!
!!!* 4. D* Fitting Type:                       * *!!!!!!!!!!!!!!
!!!* 5. S* Status:                             * *!!!!!!!!!!!!!!
!!!* 6. E*)))))) * *!!!!!!!!!!!!!!
!!!* * Loss Factors:                          * *!!!!!!!!!!!!!!
!!!.))))) * K-fa (lb-mole/yr):                  0.00 * *!!!!!!!!!!!!!!
!!!!!!!!!!!! * K-fb (lb-mole/(mph)^M-yr):       0.00 * *!!!!!!!!!!!!!!
!!!!!!!!!!!! * M (dimensionless):                0.00 * *!!!!!!!!!!!!!!
!!!!!!!!!!!! * *!!!!!!!!!!!!!!
!!!!!!!!!!!!*)-!!!!!!!!!!!!!!
!!!!!!!!!!!! * Default Quantity:                  0 *!!!!!!!!!!!!!!
!!!!!!!!!!!!.))))) <F1>=Help <Esc>=Exit <Ctrl><End>=Save ))))))-!!!!!!!!!!!!!!
!!!!!!!!!!!! * 3. Delete Fitting *!!!!!!!!!!!!!!
!!!!!!!!!!!! * 4. Print Fitting Data *!!!!!!!!!!!!!!
!!!!!!!!!!!! * 5. Estimate Fitting Factor *!!!!!!!!!!!!!!
!!!!!!!!!!!! * *!!!!!!!!!!!!!!
!!!!!!!!!!!! * *!!!!!!!!!!!!!!
!!!!!!!!!!!!.))))) -
<F1> Help

```

### 6.3.2 View/Edit Roof Fitting Data

To view or edit records in the roof fitting database, select **View/Edit Fitting** from the *Modify Roof Fitting Database* menu. The program will display a list of roof fittings as shown in **Figure 6-14**. Select the roof fitting you wish to view or edit and press [Enter]. The screen shown in **Figure 6-13** will appear. Refer to **Section 6.3.1 Add Roof Fitting Data** above for instructions on editing each field. Please be aware that changing roof fitting data may affect emissions estimates for any previously entered tanks using that particular fitting. **Note: only user-added roof fitting data may be edited.**

**FIGURE 6-14**  
View/Edit Fitting Data

[illegible]

### 6.3.3 Delete Roof Fitting Data

To delete records from the roof fitting database, select **Delete Fitting** from the *Modify Roof Fitting Database* menu. The program will display a list of roof fittings eligible for deletion as shown in **Figure 6-15**. Use the **[+]** and **[-]** keys to select and de-select roof fittings to delete and press **[Enter]** to delete the records. **Note: only user-added roof fittings may be deleted.**

**FIGURE 6-15**  
Deleting Fitting Data

```
TANKS Program 3.1                                     September 9, 1995   12:45
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!+)))))) TANKS Main Menu ))))))),!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!*                               +)))))) Database Utilities ))))))),!!!!!!!!!!
!!!*    1. Overview                                *                *!!!!!!!!!
!!!*    2. Tank Records                            *    1. Chemical Database      *!!!!!!!!!
!!!+)))))) Select Fittings to Delete )))))))) Select Fitting Type Status **!!!!!!!!!
!!!* 4444444444444444444444444444444444444444444444444444444444444444444444**!!!!!!!!!
!!!* Access Hatch (33 inches)          Unbolted Cover, Gasketed **!!!!!!!!!
!!!*                                  **!!!!!!!!!
!!!*                                  **!!!!!!!!!
!!!*                                  **!!!!!!!!!
!!!*                                  **!!!!!!!!!
!!!*                                  **!!!!!!!!!
!!!*) <F1> Help    <+/-> Mark/Unmark  <Ret> Delete Marked Fittings )))--!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!* 1. Add Fitting                        *!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!* 2. View/Edit Fitting                 *!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!* 3. Delete Fitting                    *!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!* 4. Print Fitting Data                 *!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!* 5. Estimate Fitting Factor            *!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!*                                   *!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!*                                   *!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!*                                   *!!!!!!!!!
.))))))))))-
```

<F1> Help

### 6.3.4 Print Roof Fitting Data

To print data from the roof fitting database, select **Print Fitting** from the *Modify Roof Fitting Database* menu. The program will display a list of roof fittings as shown in **Figure 6-16**. Use the [+] and [-] keys to select and de-select data to include in the report. Press [Enter] to generate the report. All reports are initially shown on screen before any printing occurs. Press [F2] to print the report, [F3] to print selected pages, and [F5] to export the report to a file in either ASCII or printer-ready format. Press [Esc] to exit without printing.

**FIGURE 6-16**  
Printing Fitting Data

```
TANKS Program 3.1                               September 9, 1995   12:45
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!+)))))) TANKS Main Menu ))))))),!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!*                                     +)))))) Database Utilities ))))))),!!!!!!!!!!
!!!*    1. Overview                       *                                *!!!!!!!!!!!!
!!!*    2. Tank Records                   *    1. Chemical Database          *!!!!!!!!!!!!
!!!+)))))) Select Fittings to Print )))))))) Select Fittings to Print ))))))),*!!!!!!!!!!
!!*      Fitting Type                      Status                          **!!!!!!!!!!!!
!!*4444444444444444444444444444444444444444444444444444444444444444**!!!!!!!!!!!!
!!* * Access Hatch (24-in. Diam.)        Bolted Cover, Gasketed           **!!!!!!!!!!!!
!!* * Access Hatch (24-in. Diam.)        Unbolted Cover, Gasketed         **!!!!!!!!!!!!
!!* * Access Hatch (24-in. Diam.)        Unbolted Cover, Ungasketed       **!!!!!!!!!!!!
!!* * Access Hatch (33 inches)            Unbolted Cover, Gasketed       **!!!!!!!!!!!!
!!* Automatic Gauge Float Well           Bolted Cover, Gasketed           **!!!!!!!!!!!!
!!* Automatic Gauge Float Well           Unbolted Cover, Gasketed       **!!!!!!!!!!!!
!!.) <F1> Help <+/-> Mark/Unmark <Ret> Print Marked Fittings )))--!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!*    1. Add Fitting                    *!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!*    2. View/Edit Fitting              *!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!*    3. Delete Fitting                 *!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!*    4. Print Fitting Data             *!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!*    5. Estimate Fitting Factor        *!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!*                                *!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!*                                *!!!!!!!!!!!!!!!!!!!!

.))))))))))--

<F1> Help
```

### 6.3.5 Estimate Fitting Factors

It may be useful to you to estimate air emission losses from various fitting factor combinations prior to actually entering tank data. This allows for hypothetical fitting scenarios to be run.

To estimate air emissions from a hypothetical selection of factors, select **Estimate Fitting Factor** from the *Modify Roof Fitting Database* menu. This will bring up the *Choose Tank Type* menu shown in **Figure 6-17**. Select the type of tank for which you wish to estimate fitting losses. Descriptions of each tank type may be found in **Section 4.0 Entering Tank Data**.

**FIGURE 6-17**  
Estimating Fitting Factors -- Choosing a Tank Type

```

TANKS Program 3.1                               September 9, 1995  12:45
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!+)))))) TANKS Main Menu ))))))),!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!*                                     +)))))) Database Utilities ))))))),!!!!!!!!!!!!!!!!
!!!* 1. Overview                         *                                     *!!!!!!!!!!!!!!
!!!* 2. Tank Records                     * 1. Chemical Database                 *!!!!!!!!!!!!!!
!!!* 3. Generate Emissions Report        * 2. Meteorological Database            *!!!!!!!!!!!!!!
!!!* 4. Database Utilities                * 3. Roof Fittings                      *!!!!!!!!!!!!!!
!!!* 5. System Utilities                 +)))))) Choose Tank Type ))))))),*!!!!!!!!!!!!!!
!!!* 6. Exit to DOS                      *                                     **!!!!!!!!!!!!!!
!!!*                                     * 1. External Floating Roof              **!!!!!!!!!!!!!!
!!!.))))))))) * 2. Internal Floating Roof    **!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!* 3. Domed External Floating Roof **!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!*                                     **!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!+)) M.))))) - *!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!* ))))) - !!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!* 1. Add Fitting                    *!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!* 2. View/Edit Fitting              *!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!* 3. Delete Fitting                 *!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!* 4. Print Fitting Data             *!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!* 5. Estimate Fitting Factor         *!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!*                                     *!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!*                                     *!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!*                                     *!!!!!!!!!!!!!!
.))))) -
<F1> Help

```

Upon selecting a tank type, the screen shown in **Figure 6-18** will appear, listing each of the fittings in the database. You may use the [+] and [-] keys to select and de-select fittings to use in your estimation. Or, you may press [F2] to select the typical fittings for the type of tank chosen. Press [Enter] to view your selections on the screen shown in **Figure 6-19**.

**FIGURE 6-18**  
Estimating Fitting Factors -- Select Fittings

```
TANKS Program 3.1                               September 9, 1995   12:45
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!+)))))) TANKS Main Menu ))))))),!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!*                                     +)))))) Database Utilities ))))))),!!!!!!!!!!
!!!*    1. Overview                        *!!!!!!!!!!!!
!!!*    2. Tank Records                    *    1. Chemical Database          *!!!!!!!!!!!!
!!!+))))))))) Select Fittings to Use in Calculation ))))))))))) ,*!!!!!!!!!!!!
!!!*      Fitting Type                      Status                          **!!!!!!!!!!!!
!!!*44444444444444444444444444444444444444444444444444444444444444444444**!!!!!!!!!!!!
!!!* Access Hatch (24-in. Diam.)           Bolted Cover, Gasketed         **!!!!!!!!!!!!
!!!* Access Hatch (24-in. Diam.)           Unbolted Cover, Gasketed        **!!!!!!!!!!!!
!!!* Access Hatch (24-in. Diam.)           Unbolted Cover, Ungasketed         **!!!!!!!!!!!!
!!!* Access Hatch (33 inches)              Unbolted Cover, Gasketed         **!!!!!!!!!!!!
!!!* Automatic Gauge Float Well            Bolted Cover, Gasketed           **!!!!!!!!!!!!
!!!* Automatic Gauge Float Well            Unbolted Cover, Gasketed        **!!!!!!!!!!!!
!!!.) <F1> Help   <F2> Pick Typical   <+/-> Mark/Unmark   <Ret> Accept )--!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!*    1. Add Fitting                       *!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!*    2. View/Edit Fitting                  *!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!*    3. Delete Fitting                     *!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!*    4. Print Fitting Data                 *!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!*    5. Estimate Fitting Factor             *!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!*                                       *!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!*                                       *!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!*                                       *!!!!!!!!!!!!!!!!!!!!!!
.)))))-----
<F1> Help
```



**FIGURE 6-19**  
Estimating Fitting Factors -- Enter Quantity of Each Fitting

[illegible]

Enter the quantity of fittings in the deck or roof. Use the up arrow, down arrow, PgUp, or PgDn keys to move through this list. After all quantities have been entered, press [Ctrl-End] to continue.

Enter the wind speed for which you wish to estimate air emissions. You may need to view the meteorological database to obtain approximate wind speeds for your location. Press [Enter] to continue.

From the *Report Options* menu, shown in **Figure 6-20**, you may opt to generate a full report or simply to have the total fitting loss factor appear on screen. Selecting **Display Factor Only** gives the loss factor  $K_F$  in lb-moles/year.

**FIGURE 6-20**  
Estimating Fitting Factors -- Report Options

```

TANKS Program 3.1                               September 9, 1995 12:46
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!+)))))) TANKS Main Menu ))))))),!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!*                                     +)))))) Database Utilities ))))))),!!!!!!!!
!!!* 1. Overview                         *                               *!!!!!!!!
!!!* 2. Tank Records                     * 1. Chemical Database         *!!!!!!!!
!!!+)))))) Select Fittings to Use in Calculation ))))))),*!!!!!!!!
!!*   Fitting Type                       Status                         **!!!!!!!!
!!*444444444444444444444444444444444444444444444444444444444444444444444444**!!!!!!!!
!!* * Access Hatch (24-in. Diam.)        Bolted Cover, Gasketed        **!!!!!!!!
!!* Access Hatch (24-in. Diam.)          Unbolted Cover, Gasketed      **!!!!!!!!
!!* Access Hatch (24-in. Diam.)          Unbol+))))))Report Options))))),!!!!!!!!
!!* Access Hatch (33 inches)             Unbol*                          *!!!!!!!!
!!* Automatic Gauge Float Well           Bolte* 1. Generate Full Report *!!!!!!!!
!!* Automatic Gauge Float Well           Unbol* 2. Display Factor Only *!!!!!!!!
!!.) <F1> Help <F2> Pick Typical <+/-> M*                               *!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!* 1. Add Fitt.)))))--!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!* 2. View/Edit Fitting          *!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!* 3. Delete Fitting            *!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!* 4. Print Fitting Data         *!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!* 5. Estimate Fitting Factor     *!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!*                               *!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!*                               *!!!!!!!!
.)))))--
<F1> Help

```

To generate a full report, select **Generate Full Report** from the *Report Options* menu. The report will show each fitting type, loss factors for each fitting, quantity, wind speed, and estimated loss factor for the entire scenario. Press [F2] to print the report, [F3] to print selected pages, and [F5] to export the report to a file in either ASCII or printer-ready format.

#### 6.4 Rim Seal Database

This option allows you to view, edit, add, delete or print data in the rim seal system database. These options work in a similar manner as the options for the roof fitting database described above. Data on program supplied rim seals may only be viewed or printed; it may not be edited. If errors are found in the original data, EPA will identify them in announcements on the CHIEF bulletin board and supply instructions for correcting any problems.

To add, edit, modify, or print information in the rim seals database choose the **Rim Seals** option from the *Database Utilities* menu. The program will display the *Rim Seals Data* menu as shown in **Figure 6-21**.

**FIGURE 6-21**  
Modifying Rim Seal Database

```

TANKS Program 3.1                               September 9, 1995  12:56
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!+)))))) TANKS Main Menu ))))))),!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!*                                     +)))))) Database Utilities ))))))),!!!!!!!!!!!!!!!!
!!!*  1. Overview                         *                                     *!!!!!!!!!!!!!!
!!!*  2. Tank Records                     *  1. Chemical Database                 *!!!!!!!!!!!!!!
!!!*  3. Generate Emissions Report        *  2. Meteorological Database            *!!!!!!!!!!!!!!
!!!*  4. Database Utilities               *  3. Roof Fittings                     *!!!!!!!!!!!!!!
!!!*  5. System Utilities                 *  4. Rim Seals                         *!!!!!!!!!!!!!!
!!!*  6. Exit to DOS                     *  5. Reindex Databases                  *!!!!!!!!!!!!!!
!!!*                                     *  6. Switch Data Directory              *!!!!!!!!!!!!!!
!!!*  7. Import/Export TANKS Data         *  7. Import/Export TANKS Data            *!!!!!!!!!!!!!!
!!!*  8. Backup/Restore from Backup       *  8. Backup/Restore from Backup          *!!!!!!!!!!!!!!
!!!*  9. Merge Data Directories           *  9. Merge Data Directories             *!!!!!!!!!!!!!!
!!!*                                     *  +)) Modify Rim Seal Database ))),      *!!!!!!!!!!!!!!
!!!*                                     *  *)))))))-!!!!!!!!!!!!!!
!!!*  1. Add Seal                         *!!!!!!!!!!!!!!
!!!*  2. View/Edit Seal                   *!!!!!!!!!!!!!!
!!!*  3. Delete Seal                      *!!!!!!!!!!!!!!
!!!*  4. Print Seal Data                   *!!!!!!!!!!!!!!
!!!*                                     *!!!!!!!!!!!!!!
!!!*  .)))))))-!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
<F1> Help

```

#### 6.4.1 Add Rim Seal Data

To add new records to the rim seal database, select **Add Seal** from the *Modify Rim Seal Database* menu. The program will display the Rim Seal Configuration screen as shown in **Figure 6-22**. Fill in each field as described below.

**Primary Seal.** Enter the name of the primary seal type.

**Secondary Seal?.** Enter [Y] or [N] to indicate whether a secondary seal is present.

**Secondary Description.** If [Y] was selected for "Secondary Seal?" above, enter a description of the secondary seal. Otherwise the program will enter "None" in this field.

**Rim Seal Factors.** Enter the rim seal loss factors K-ra, K-rb, and N. These are described in greater detail in AP 42, Section 7.1. These factors are used to calculate the total rim seal loss factor as follows:

$$K_R = K_{ra} + K_{rb} (V)^N$$

where:

$K_R$  is the total rim seam loss factor (lb-mole/ft.yr)  
 $K_{ra}$  is the non-wind dependent loss factor (lb-mole/ft.yr)  
 $K_{rb}$  is the wind dependent loss factor (lb-mole/(mph)<sup>N</sup>ft.yr)  
 $V$  is the average wind speed (mph)  
 $N$  is the seal related wind speed exponent (dimensionless)

**Applicability of Factors.** Indicate the types of tanks to which the rim seal applies. This will determine whether the rim seal is available during data entry for each tank type. Enter [Y] or [N] to indicate applicability.

**Applicable Tank Construction.** Indicate whether this rim seal applies to welded and/or riveted tanks using [Y] or [N].

**FIGURE 6-22**  
Adding Rim Seal Data

[illegible]

#### 6.4.2 Edit/View Rim Seal Data

To view or edit records in the rim seal database, select **View/Edit Seal** from the *Modify Rim Seal Database* menu. The program will display a list of rim seals as shown in **Figure 6-23**. Select the rim seal you wish to view or edit and press [Enter]. Refer to **Section 6.4.1 Add Rim Seal Data** above for instructions on editing each field. Please be aware that changing rim seal data may affect emissions estimates for any previously entered tanks using that particular rim seal. **Note: only user-added rim seal data may be edited.**



**FIGURE 6-24**  
Deleting Rim Seal Data

[illegible]

#### 6.4.4 Print Rim Seal Data

To print data from the rim seal database, select **Print Seal Data** from the *Modify Rim Seal Database* menu. The program will display a list of rim seals as shown in **Figure 6-25**. Use the [ + ] and [ - ] keys to select and de-select data to include in the report. Press [Enter] to generate the report. All reports are initially shown on screen before any printing occurs. Press [F2] to print the report, [F3] to print selected pages, and [F5] to export the report to a file in either ASCII or printer-ready format.

**FIGURE 6-25**  
Printing Rim Seal Data

[illegible]

If the computer system has a power failure or other sudden outage, use this option to generate new indices to correct damaged index files. This option will re-build the system and tank index files (< filename> .CDX). Anytime a "record out of range" error is received, reindexing the files may correct the problem.

You may wish to use different tank data directories when using TANKS 3.1. It may help you organize your files in a more efficient manner to have multiple "TANKDATA" directories for various groups of tanks. Each time you use TANKS 3.1, you may select the tank data directory you wish to use.

## 6.7 Import/Export TANKS Data

The **Import/Export TANKS Data** option on the *Database Utilities* menu allows you to incorporate other tank and system databases into TANKS 3.1. These may be databases from earlier versions of TANKS, or data created by another user. Upon selection of the import/export option, the *Import/Export TANKS Data* menu will appear. Refer to the discussion below for instructions on each option.

### 6.7.1 Importing TANKS Data

To import an entire database from TANKS Version 1.0 or 2.0 select **Import TANKS Data** from the *Import/Export TANKS Data* menu. The program will request the version of TANKS data being imported. Enter 1.0 or 2.0. The program will request the drive and directory where the TANKS 1.0 or 2.0 data resides (see **Figure 6-26**). The program will append new tank records to the storage tank database in Version 3.1. Tank records from Version 1.0 or 2.0 which have the same Identification Numbers as records in Version 3.1 will not be added. In addition, the program will update the TANKS 3.1 chemical and meteorological databases with any user-defined records from previous versions.

If you are upgrading from version 3.0 to 3.1, use the Merge Database utilities described in Section 6.9.

### 6.7.2 Importing Tank Records from a dBase File

To import tank records (tank.dbf file) from a dBase file, select **Import from dBase File** from the *Import/Export TANKS Data* menu. The program will request the drive, subdirectory, and name of the dBase file containing the records to be appended to the tank records. The structure of the file must be compatible with the structure of TANK.DBF. (Use the Export Database Structure option to create a file with the appropriate structure, as explained in **Section 6.7.3** below.) After verifying database compatibility, the program will append the records from the dBase file to the storage tank database. Refer to the Data Dictionary in Appendix A for a listing of the correct database structure and for descriptions of the database fields.

### 6.7.3 Export TANKS Database Structures and Data

To export DBF database file with the correct database structure for TANKS, select **Export TANKS Data/Data Structures** from the *Import/Export TANKS Data* menu. You must create any new directories from outside of the TANKS 3.1 program. The program will request the drive, subdirectory, and name of the new tank data directory and ask whether you want to fill the new databases with current data. The program will then ask you whether you want to export the system databases (chemical, city, fit-tbl, and rim-seal). If you wish to export the system files, press [Y] and enter the new data directory. The program will then ask whether you want to fill the system databases with your current data.

## 6.8 Backup/Restore from Backup



This option allows the user to backup TANKS 3.1 data in archived format to a floppy disk or computer hard drive or to restore data that was previously archived. When this option is selected from the *Database Utilities* menu, the *Backup/Restore from Backup Menu* will appear.

#### 6.8.1 Backup Data

To backup the tank data and the system data, select the **Backup Data** option from the *Backup/Restore from Backup* menu. When this option is selected, the program will ask for the drive letter and the directory in which the backup should reside. The data will be archived into two files using PKZIP software that has been incorporated into TANKS 3.1. The tank data will be "zipped" into the file TANK\*\*\*\*.ZIP where \*\*\*\* is the month and day. You may specify a different name if you wish. The system data will be archived (or "zipped") into the file SYS\*\*\*\*.ZIP where \*\*\*\* is the month and day, unless otherwise specified.

#### 6.8.2 Restore Data from Backup

To restore TANKS 3.1 data from a backup, select the **Restore Data from Backup** option from the *Backup/Restore from Backup* menu. This option allows the user to restore archived data to the system. When this option is selected, the program will ask for the drive and directory on which the archived data resides. A list of all archived system files in that drive and directory will appear. Highlight the desired file and press [Enter]. The program will then list all of the archived tank data files in that directory. Highlight the desired file and press [Enter]. The system will overwrite current data with the archived data.

#### 6.9 Merge Data Directories

The options described above enable you to copy data and entire directories to other locations on your computer's hard-drive or network. In the course of organizing your data, you may wish to merge together two databases.

To merge databases, select **Merge Data Directories** from the *Database Utilities* menu. The screen shown in **Figure 6-26** will appear. Enter the two tank data directories followed by the two system data directories and press [Ctrl-End] to execute the merge. Press [Esc] to exit without merging data.

**FIGURE 6-26**  
Merging Tank Data and System Data Directories

[illegible]

## 7.0 SYSTEM UTILITIES

The **System Utilities** option on the *TANKS Main Menu* allows you to select printers, perform DOS functions from within TANKS 3.1, select screen colors, and obtain information about the status of TANKS 3.1 configuration and installation parameters. Select this option to reach the *System Utilities* menu (see **Figure 7-1**).

## 7.1 System Information

The **System Information** option displays computer configuration information about the system. To select this option, highlight it and press [Enter]. The program will display the System Information screen (see **Figure 7-2**). This screen lists the following system information:

**Program Version.** This should read "TANKS Program 3.1".

**Processor.** The type of computer in use, such as an 80386 or 80486.

**DOS Memory Available.** The amount of conventional DOS RAM memory available to TANKS. This should not be confused with the Disk Space Available (see below), which refers to the amount of storage space available on the hard drive or network.

**FIGURE 7-1**  
The System Utilities Menu

[illegible]

**EMS Memory Available.** The amount of expanded memory available to TANKS.

**Open Files Available.** The number of files that may be open at one time. The number that appears here is determined by the computer's CONFIG.SYS file. For information on the CONFIG.SYS file, see **Section 2.3 Configuration Files**.

**Program Files.** The drive and directory in which the program is installed.

**System Data Files.** The drive and directory in which the system data files (chemical.dbf, cities.dbf, fit-tbl.dbf, and rimseal.dbf) are stored.

**Tank Data Files.** The drive and directory in which the tank data files (tank.dbf, storage.dbf, mixture.dbf and fitting.dbf) are stored.

**Disk Space Available.** The amount of space available on the drive in which the program and data files are located.

**Temporary Files.** The drive and directory in which the temporary files are created and deleted during program operation.

**Disk Space Available.** The amount of space available on the drive in which the temporary files are located.

**Printer Status.** Indicates whether the program detects a ready printer hooked up to the computer.

**Video Adapter.** The type of video card installed on the computer.

## 7.2 Shell to DOS

The **Shell to DOS** option allows the user to exit to DOS without actually exiting the program. After selecting this option and performing any needed DOS functions such as copying or moving files, type "Exit" from the DOS prompt and press [Enter] to return to the program. Do not use this option to exit and access other software using large amounts of memory.

**FIGURE 7-2**  
The System Information Screen

```
TANKS Program 3.1                               September 9, 1995      2:38
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!+)))))) TANKS Main Menu ))))))),!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!*                                     +)))) System Utilities )))),!!!!!!!!!!!!!!
!!!* 1. Overview                           *                             *!!!!!!!!!!!!!!
!!!* 2. Tank Records                       +))))))))) System Information ))))))))
!!!* 3. Generate Emissions *
!!!* 4. Database Utilities *               Program Version: TANKS Program 3.1
!!!* 5. System Utilities *
!!!* 6. Exit to DOS *                     Processor: 80486
!!!* * DOS Memory Available: 402 k
!!!.)))))))))) * EMS Memory Available: 3487 k
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!! Open Files Available: 99
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!! Program Files: D:\TANKS3\
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!! System Data Files: D:\TANKS3\DATA\
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!! Tank Data Files: D:\TANKS3\tANKD2\
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!! Disk Space Available: 83095 k
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!! Temporary Files: D:\TANKS3\TEMP\
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!! Disk Space Available: 83095 k
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!! Printer Status: READY
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!! Video Adapter: VGA/Color
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!! FoxPro 2.6a EXE Support Library (X)
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!
<F1> Help .))))))))) [Esc]-Exit ))))))))
```

### 7.3 Printer Selection

This option allows you to select the printer being used. When this option is selected, a list of printer definitions will appear (see **Figure 7-3**).

**Select a Printer.** To select a printer from the list, highlight it and press [Enter]. When you select a printer, the program will adapt itself to the print codes of that printer.

**Edit a Printer.** To edit print codes for a printer, press [F2]. A Printer Definition Screen will appear. Consult your technical support staff or printer documentation for information on filling out the Printer Definition Screen.

**Add a Printer.** To add a printer to the list, press [Ins]. A blank Printer Definition Screen will appear. Consult your technical support staff or printer documentation for information on filling out the Printer Definition Screen.

**Delete a Printer.** To delete a printer from the list, highlight it and press [Del]. The system will ask the user to confirm the deletion.

## Printer Selection

<F1> Help

## 7.4 Change Screen Colors

This option allows you to modify the color selection for the TANKS 3.1 screens. When this option is selected, a list of alternative color schemes will appear (see **Figure 7-4**). Highlight the desired color scheme and press [Enter]. In order for the selected color scheme to take effect, you must exit and then re-start the program.

**FIGURE 7-4**  
Color Scheme Selection

```

TANKS Program 3.1                               September 9, 1995   2:38
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!+)))))) TANKS Main Menu ))))))),!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!*                                     +)))) System Utilities ))))*,!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!* 1. Overview                         *                               *!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!* 2. Tank Records                     * 1. System Information      *!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!* 3. Generate Emissions Report        * 2. Shell to DOS              *!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!* 4. Database Utilities                * 3. Printer Selection        *!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!* 5. System Utilities                  * 4. Change Screen Colors     *!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!* 6. Exit to DOS                      * 5. Change Printer Port      *!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!*                                     *                               *!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!*                                     *                               *!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!.))))))))) +)) Color Schemes )),.))))))))) - !!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!* ALT2.COL                               *!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!* ALTERNAT.COL                         *!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!* BLUES.COL                             *!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!* BLUE_RED.COL                         *!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!* BRIGHT.COL                           *!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!* DULL.COL                              *!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!* MONO.COL                              *!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!* STANDARD.COL                         *!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!* TANKS.COL                             *!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!*                                     *!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!*                                     *!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
.))))))))) -
<F1> Help

```

## 7.5 Change Printer Port

This option allows you to select a different printer port. When this option is selected, a window will appear with the LPT1 or LPT2 port choices. Highlight the desired printer port and press [Enter].

*[This page intentionally left blank.]*



## APPENDIX A: DATA DICTIONARY

The Data Dictionary is a listing of data fields in each of the eight TANKS databases. During normal operation there is no need to edit or work with the databases directly. The Data Dictionary is provided for your reference. (Fields marked with an "\*" are additions to TANKS 3.1 and were not included in Versions 1.0 or 2.0 of the program).

Do not change program data without a thorough understanding of .DBF databases, records and fields. Never modify the database structures. Any software that reads and writes .DBF format files will be able to modify the data.

**CHEMICAL.DBF** - Contains properties and characteristics of chemicals from the chemical list.

<u>FIELD NAME</u>	<u>DESCRIPTION</u>	<u>TYPE</u>	<u>LENGTH</u>
1 NAME	Chemical Name	C	33
2 GRAVITY	Specific Gravity	N	6
3 FORMULA	Chemical Formula	C	30
4 CAS	CAS Number	C	10
5 CATEGORY	Chemical Category	C	30
6 REFINED	= .T. if Refined Chemical	L	1
7 CRUDE	= .T. if Crude Oil	L	1
8 PETROCHEM	= .T. if Organic Liquid	L	1
9 MOLWT	Molecular Weight	N	8
10 BOILING	Boiling Point	N	5
11 VP_MOLWT	Vapor Molecular Weight	N	8
12 L_DENS	Liquid Density	N	8
13 VP	Displayed Vapor Pressure	N	12
14 VP_40	Vapor Pressure at 40°	N	12
15 VP_50	Vapor Pressure at 50°	N	12
16 VP_60	Vapor Pressure at 60°	N	12
17 VP_70	Vapor Pressure at 70°	N	12
18 VP_80	Vapor Pressure at 80°	N	12
19 VP_90	Vapor Pressure at 90°	N	12
20 VP_100	Vapor Pressure at 100°	N	12
21 VP_A	Vapor Equation Constant A	N	8
22 VP_B	Vapor Equation Constant B	N	8
23 VP_X_MIN	Minimum Temp. for A, B	N	7
24 VP_X_MAX	Maximum Temp. for A, B	N	7
25 VP_COEF_A	Antoine's Coeff. A	N	7
26 VP_COEF_B	Antoine's Coeff. B	N	8
27 VP_COEF_C	Antoine's Coeff. C	N	8
28 ASTM_SLOPE	Distillation Slope	N	3
29 REID	Reid Vapor Pressure	N	7
30 USER_DEF	= .T. if user-defined	L	1
31 CHEM_KEY	Error Check Key Value	N	18
32 VP_2_A	Antoine's Coeff. A (Form 2)	N	9
33 VP_2_B	Antoine's Coeff. B (Form 2)	N	7
34 TANKS1NAME	Tanks Version 1.0 Name*	C	30

Indices:

<u>INDEX TAG</u>	<u>INDEX KEY</u>
NAME	upper(NAME)
CAS	CAS

**CITIES.DBF** - Contains meteorological data for specific locations.

<u>FIELD NAME</u>	<u>DESCRIPTION</u>	<u>TYPE</u>	<u>LENGTH</u>
1 CITY	City Name	C	20
2 STATE	State Name	C	15
3 ABBREV	State Abbreviation	C	2
4 A_TEMP_DAA	Avg. Daily Amb. Temperature	N	6
5 TAX_JAN	Max. Daily Temp. for January	N	6
6 TAX_FEB	Max. Daily Temp. for February	N	6
7 TAX_MAR	Max. Daily Temp. for March	N	6
8 TAX_APR	Max. Daily Temp. for April	N	6
9 TAX_MAY	Max. Daily Temp. for May	N	6
10 TAX_JUN	Max. Daily Temp. for June	N	6
11 TAX_JUL	Max. Daily Temp. for July	N	6
12 TAX_AUG	Max. Daily Temp. for August	N	6
13 TAX_SEP	Max. Daily Temp. for September	N	6
14 TAX_OCT	Max. Daily Temp. for October	N	6
15 TAX_NOV	Max. Daily Temp. for November	N	6
16 TAX_DEC	Max. Daily Temp. for December	N	6
17 TAX_ANN	Annual Daily Maximum Temp.	N	6
18 TAN_JAN	Min. Daily Temp. for January	N	6
19 TAN_FEB	Min. Daily Temp. for February	N	6
20 TAN_MAR	Min. Daily Temp. for March	N	6
21 TAN_APR	Min. Daily Temp. for April	N	6
22 TAN_MAY	Min. Daily Temp. for May	N	6
23 TAN_JUN	Min. Daily Temp. for June	N	6
24 TAN_JUL	Min. Daily Temp. for July	N	6
25 TAN_AUG	Min. Daily Temp. for August	N	6
26 TAN_SEP	Min. Daily Temp. for September	N	6
27 TAN_OCT	Min. Daily Temp. for October	N	6
28 TAN_NOV	Min. Daily Temp. for November	N	6
29 TAN_DEC	Min. Daily Temp. for December	N	6
30 TAN_ANN	Annual Daily Min. Temp.	N	6
31 INSOL_JAN	Solar Insolation for January	N	6
32 INSOL_FEB	Solar Insolation for February	N	6
33 INSOL_MAR	Solar Insolation for March	N	6
34 INSOL_APR	Solar Insolation for April	N	6
35 INSOL_MAY	Solar Insolation for May	N	6
36 INSOL_JUN	Solar Insolation for June	N	6
37 INSOL_JUL	Solar Insolation for July	N	6
38 INSOL_AUG	Solar Insolation for August	N	6

39	INSOL_SEP	Solar Insolation for September	N	6
40	INSOL_OCT	Solar Insolation for October	N	6
41	INSOL_NOV	Solar Insolation for November	N	6
42	INSOL_DEC	Solar Insolation for December	N	6
43	INSOL_ANN	Annual Solar Insolation Factor	N	6
44	WIND	Wind Speed	N	4
45	COMPLETE	= .T. if record is complete	L	1
46	WIND_JAN	Avg. Wind Speed for January	N	6
47	WIND_FEB	Avg. Wind Speed for February	N	6
48	WIND_MAR	Avg. Wind Speed for March	N	6
49	WIND_APR	Avg. Wind Speed for April	N	6
50	WIND_MAY	Avg. Wind Speed for May	N	6
51	WIND_JUN	Avg. Wind Speed for June	N	6
52	WIND_JUL	Avg. Wind Speed for July	N	6
53	WIND_AUG	Avg. Wind Speed for August	N	6
54	WIND_SEP	Avg. Wind Speed for September	N	6
55	WIND_OCT	Avg. Wind Speed for October	N	6
56	WIND_NOV	Avg. Wind Speed for November	N	6
57	WIND_DEC	Avg. Wind Speed for December	N	6
58	WIND_ANN	Avg. Annual Wind Speed*	N	6
59	MET_KEY	Error Check Key Value*	N	18
60	USER_DEF	= .T. if User-Defined	L	1
61	ATMOS_PRS	Atmospheric Pressure*	N	5

Indices:

<u>INDEX TAG</u>	<u>INDEX KEY</u>
CITY	CITY
STATE	STATE + CITY

DBDICT.DBF - Program's data dictionary.

<u>FIELD NAME</u>	<u>DESCRIPTION</u>	<u>TYPE</u>	<u>LENGTH</u>
1 FIELD_NAME	Field Name	C	10
2 FIELD_TYPE	Field Type	C	1
3 FIELD_LEN	Field Length	N	3
4 FIELD_DEC	Field Decimals	N	3
5 IN_FILE	Database	C	10
6 FIELD_ORD	Field Order	N	3
7 HEADING	Heading	C	15
8 DESCRIPT	Description	C	30
9 INPUT_FXN	Input Function	C	30
10 DISP_FXN	Display Function	C	30
11 VALID_FXN	Validity Function	C	30
12 PROG_DESCR	Notes	C	10
13 INDEX_EXP	Index Expression*	C	202
14 ERROR_MSG	Error Message*	C	60

Indices:

<u>INDEX TAG</u>	<u>INDEX KEY</u>
FIELD_ORD	IN_FILE + STR(FIELD_ORD,3)

**DBFILES.DBF** - Contains database definitions.

<u>FIELD NAME</u>	<u>DESCRIPTION</u>	<u>TYPE</u>	<u>LENGTH</u>
1 DB_NAME	Database Name	C	8
2 DB_DESCRIP	Database Description	C	40
3 DB_CREATED	Creation Date	D	8
4 DB_UPDATED	Last Update	D	8
5 DB_PACK	Set to .T. to pack database	L	1
6 DB_IN_USE	In-Use Indicator	C	40

Index:

<u>INDEX TAG</u>	<u>INDEX KEY</u>
DB_NAME	padr(upper(DB_NAME),8)

**EMISSION.DBF** - Stores emissions report data. Each record represents one set of calculations performed in a report.

<u>FIELD NAME</u>	<u>DESCRIPTION</u>	<u>TYPE</u>	<u>LENGTH</u>
1 IDX_ID	Internal Tank ID Number	C	10
2 MIX_ID	Internal Mixture ID Number	C	2
3 PRIMARY	= .T. if Single Component Stock	L	1
4 NAME	Mixture/Component Name	C	33
5 ALPHA	Paint Solar Absorbance, Shell	N	4
6 ALPHA_2	Paint Solar Absorbance, Roof	N	4
7 BULK_T	Liquid Bulk Temperature	N	6
8 ALS_TEMP	Average Liquid Surface Temp.	N	6
9 MLS_TEMP	Minimum Liquid Surface Temp.	N	6
10 XLS_TEMP	Maximum Liquid Surface Temp.	N	6
11 VT_RANGE	Vapor Temperature Range	N	6
12 LM_FRACT	Liquid Mole Fraction	N	8
13 VM_FRACT	Vapor Mole Fraction	N	8
14 MOLES	Moles	N	10
15 VM_WEIGHT	Vapor Molecular Weight	N	10
16 L_MO_FRACT	Liquid Mole Fraction	N	8
17 V_MO_FRACT	Vapor Mole Fraction	N	8
18 A_VP	Avg. Vapor Pressure	N	10
19 M_VP	Min. Vapor Pressure	N	10
20 X_VP	Max. Vapor Pressure	N	10

21	VP_RANGE	Vapor Pressure Range	N	10
22	RF_OUT	Roof Outage	N	5
23	VS_OUT	Vapor Space Outage	N	5
24	VS_VOL	Vapor Space Volume	N	8
25	V_DENS	Vapor Density	N	8
26	BV_RANGE	Breather Vent Range	N	5
27	K_E	Vapor Space Expansion Factor	N	10
28	K_S	Vented Vapor Saturation Factor	N	10
29	S_LOSS	Standing Losses	N	12
30	W_LOSS	Withdrawal Losses	N	12
31	RIM_LOSS	Rim-Seal Losses	N	12
32	ROOF_LOSS	Roof-Fitting Losses	N	12
33	MONTH	Number of Active Month	C	2
34	LV	Liquid Volume	N	16
35	N	Number of Turnovers	N	5
36	K_N	Turnover Factor	N	10
37	K_P	Working Loss Product Factor	N	6
38	T_RANGE	Temperature Range	N	7
39	AMB_T	Average Ambient Temperature	N	7
40	T_MIN	Minimum Ambient Temperature	N	7
41	T_MAX	Maximum Ambient Temperature	N	7
42	SEAM_LOSS	Deck Seam Losses	N	12
43	DECK_LOSS	Deck-Fitting Losses	N	12
44	M_KR	Seal Factor (lb-mole/((mph)^n)	N	10
45	P_A	Atmospheric Pressure	N	5
46	M_P	Value of Vapor Pressure Fun.	N	10
47	M_KC	Product Factor	N	10
48	M_C	Shell Clingage Factor	N	10
49	NC	Number of Columns	N	10
50	FC	Effective Column Diameter (ft)	N	10
51	M_FF	Total Roof/Deck Fitting Loss Fact.	N	10
52	SD	Deck Seam Length Factor (ft/ft)	N	10
53	KD	D. Seam Loss Factor	N	10
54	N_FACT	Seal-related Wind Speed Exp.	N	4
55	TANK_TYPE	Type of Tank	C	25
56	ID	Tank Identification Number	C	10
57	DIAMETER	Tank Diameter (ft)	N	4
58	HEIGHT_S	Shell Height (ft)	N	4
59	HEIGHT_R	Roof Height (ft)	N	6
60	HEIGHT_L	Maximum Liquid Height (ft)	N	4
61	VOLUME	Liquid Volume (gal)	N	9
62	RF_TYPE	Roof Type (Cone, Dome)	C	11
63	C_SLOPE	Slope of Cone Roof	N	10
64	D_RADIUS	Dome Roof Radius	N	4
65	VENT_P	Breather Vent		7
66	VENT_V	Breather Vent Vacuum Setting	N	5
67	TCOLOR	Shell Color	C	8
68	SHADE	Shell Shade	C	8
69	PT_COND	Paint Condition (Shell)	C	4
70	RF_SHADE	Roof Shade	C	8

71 RF_COND	Paint Condition (Roof)	C	4
72 RF_COLOR	Roof Color	C	8
73 S_COND	Condition of Shell Lining	C	13
74 Q_NET	Throughput	N	13
75 UNDER	= .T. if Underground	L	1
76 TURNOVER	Turnovers/Year	N	6
77 TCITY	Actual City	C	25
78 TSTATE	Actual State	C	2
79 COMPANY	Company Name	C	30
80 CITY	City from Meteorological Datab	C	20
81 STATE	State from Meteorological Data	C	15
82 C_MEASURE	Component Weight/Weight Percen	N	1
83 CONSTRUCT	Tank Construction	C	29
84 SEAL_FIT	Seal Fitting Type	C	7
85 RIM_SEAL	Rim Seal Type	C	55
86 RIM_PRIM	Primary Seal Type	C	15
87 RIM_SEC	Secondary Seal Type	C	15
88 RIM_SEC_F	= .T. if Secondary Seal Exists	L	1
89 FITTING	Fitting Category	C	12
90 DECK_TYPE	Type of Deck	C	6
91 DECK_SEAM	Deck Seam Length	N	6
92 COL_NO	Number of Columns	N	3
93 COL_DIAM	Column Diameter	N	3
94 SELF_SUP	= .T. if Roof is Self-Supported	L	1
95 HEIGHT_AL	Average Liquid Height (ft)	N	4
96 MOLWT	Molecular Weight	N	8
97 INSOL	Solar Insolation Factor	N	7
98 M_V	Wind Speed (mph)	N	5
99 L_DENS	Liquid Density (lb/gal)	N	10
100 EFF_DIAM	Effective Tank Diameter (ft)	N	4
101 M_KRA	Rim Seal Factor (Nonwind Dependent)*N	3	
102 M_KRB	Rim Seal Factor (Wind Dependent)*	N	3

**FITTINGS.DBF** - Contains information about roof/deck fittings for floating roof tanks.

<u>FIELD NAME</u>	<u>DESCRIPTION</u>	<u>TYPE</u>	<u>LENGTH</u>
1 IDX_ID	Internal ID Number	C	10
2 FIT_TYPE	Fitting Type	C	41
3 COVR_TYPE	Description of Fitting Cover	C	41
4 K_FA	Roof Fitting Constant K_Fa	N	5
5 K_FB	Roof Fitting Constant K_Fb	N	7
6 K_M	Roof Fitting Constant m	N	4
7 K_F	Deck Fitting Constant K_F	N	4
8 QUANTITY	Quantity of Fitting	N	4
9 FIT_KEY	Error Checking Key*	N	18
10 USER_DEF	= .T. if User Defined*	L	1

Indices:

<u>INDEX TAG</u>	<u>INDEX KEY</u>
IDX_ID	IDX_ID
PAD_IDX	IDX_ID + str(100000-recno(),6)

**FIT\_TBL.DBF** - Contains characteristics of specific roof/deck fitting types.

<u>FIELD NAME</u>	<u>DESCRIPTION</u>	<u>TYPE</u>	<u>LENGTH</u>
1 FIT_TYPE	Type of Fitting	C	41
2 COVR_TYPE	Cover Description	C	41
3 K_FA	Roof Fitting Constant K_Fa	N	4
4 K_FB	Roof Fitting Constant K_Fb	N	7
5 K_M	Roof Fitting Constant m	N	4
6 K_F	Deck Fitting Constant K_F	N	5
7 QUANTITY	Number of Fitting	N	4
8 TYPICAL	= .T. if in Typical Category	L	1
9 CONTROLLED	= .T. if in Controlled Category	L	1
10 UNCONTROL	= .T. if Uncontrolled Category	L	1
11 D_ROOF	= .T. if for Double Deck Roofs	L	1
12 P_SEAL	= .T. if for Primary Seal	L	1
13 WELD_DECK	= .T. if for Welded Decks	L	1
14 SELF_SUP	= .T. if for Self-Supported Roofs	L	1
15 ROOF_TYPE	Internal or External*	C	9
16 TBL_KEY	Error Check Key*	C	17
17 USER_DEF	= .T. if User Defined*	L	1
18 TYP_EFLT	= .T. for Typical External Floating Tanks* L	1	
19 TYP_IFLT	= .T. for Typical Internal Floating Tanks* L	1	

Index:

<u>INDEX TAG</u>	<u>INDEX KEY</u>
FIT_TYPE	FIT_TYPE + COVR_TYPE

**HELP.DBF**

<u>FIELD NAME</u>	<u>DESCRIPTION</u>	<u>TYPE</u>	<u>LENGTH</u>
1 HELP_PRG	Help Screen Program Reference	C	10
2 HELP_FIELD	Help Field Name	C	10
3 HELP_INDEX	Help Index Reference	C	30

4 HELP_TEXT	Help Text Reference	M	10
5 HELP_ORDER	Help Screen Order	N	3

**MIXTURE.DBF** - Contains information on liquid mixtures. Each record represents one mixture in a tank.

<u>FIELD NAME</u>	<u>DESCRIPTION</u>	<u>TYPE</u>	<u>LENGTH</u>
1 C_CATEGORY	Chemical Category	C	25
2 COMPONENT	Multiple or Single Designation	C	8
3 SPEC_OPT	Speciation Option	C	23
4 JANUARY	= .T. if Active for January	L	1
5 FEBRUARY	= .T. if Active for February	L	1
6 MARCH	= .T. if Active for March	L	1
7 APRIL	= .T. if Active for April	L	1
8 MAY	= .T. if Active for May	L	1
9 JUNE	= .T. if Active for June	L	1
10 JULY	= .T. if Active for July	L	1
11 AUGUST	= .T. if Active for August	L	1
12 SEPTEMBER	= .T. if Active for September	L	1
13 OCTOBER	= .T. if Active for October	L	1
14 NOVEMBER	= .T. if Active for November	L	1
15 DECEMBER	= .T. if Active for December	L	1
16 IDX_ID	Internal Tank ID Number	C	10
17 MIX_ID	Internal Mixture ID Number	C	2
18 NAME	Mixture Name	C	30
19 MOLWT	Molecular Weight	N	8
20 L_DENS	Liquid Density	N	6
21 VP	Average Vapor Pressure	N	12
22 VP_MIN	Minimum Vapor Pressure	N	12
23 VP_MAX	Maximum Vapor Pressure	N	12
24 ALS_TEMP	Avg. Liq. Surface Temperature	N	6
25 MLS_TEMP	Min. Liq. Surface Temperature	N	6
26 XLS_TEMP	Max. Liq. Surface Temperature	N	6
27 CAS	CAS Number	C	15
28 VP_MOLWT	Vapor Molecular Weight	N	8
29 JAN_THRU	Throughput for January	N	12
30 FEB_THRU	Throughput for February	N	12
31 MAR_THRU	Throughput for March	N	12
32 APR_THRU	Throughput for April	N	12
33 MAY_THRU	Throughput for May	N	12
34 JUN_THRU	Throughput for June	N	12
35 JUL_THRU	Throughput for July	N	12
36 AUG_THRU	Throughput for August	N	12
37 SEP_THRU	Throughput for September	N	12
38 OCT_THRU	Throughput for October	N	12
39 NOV_THRU	Throughput for November	N	12
40 DEC_THRU	Throughput for December	N	12
41 TANK_TYPE	Tank Type (used for profiles)	C	25



42 PROFILE	= .T. if Profile Record	L	1
43 BULK_TEMP	Bulk Liquid Temperature*	N	6

Indices:

<u>INDEX TAG</u>	<u>INDEX KEY</u>
IDX_ID	IDX_ID + MIX_ID
NAME	UPPER(NAME)

**P\_CODES.DBF** - Stores printer definitions.

<u>FIELD NAME</u>	<u>DESCRIPTION</u>	<u>TYPE</u>	<u>LENGTH</u>
1 P_NAME	Printer Name	C	30
2 P_TYPE	Printer Type	N	1
3 P_RESET	Reset Code	C	60
4 P_ENDJOB	End of Job Code	C	60
5 P_LETTER	Letter Size Code	C	60
6 P_LEGAL	Legal Size Code	C	60
7 P_6LPI	6 LPI Code	C	60
8 P_8LPI	8 LPI Code	C	60
9 P_10CPI	10 CPI Code	C	60
10 P_12CPI	12 CPI Code	C	60
11 P_COMPRESS	Compressed Mode	C	60
12 P_LANDSCAP	Landscape Mode	C	60
13 P_PORTRAIT	Portrait Mode	C	60
14 P_BOLDON	Set Bold On	C	60
15 P_BOLDOFF	Set Bold Off	C	60
16 P_ULINEON	Set Underline On	C	60
17 P_ULINEOFF	Set Underline Off	C	60
18 P_ITALON	Set Italics On	C	60
19 P_ITALOFF	Set Italics Off	C	60
20 P_DGE_NAME	DGE Name	C	24

Index:

<u>INDEX TAG</u>	<u>INDEX KEY</u>
P_NAME	padr(upper(P_NAME),30)

**RIMSEAL.DBF** - Stores information on rim seal factors.

<u>FIELD NAME</u>	<u>DESCRIPTION</u>	<u>TYPE</u>	<u>LENGTH</u>
1 USER_DEF	= T if User-Defined	L	1
2 PRIM_SEAL	Primary Seal Name	C	15
3 SECND_SEAL	Secondary Seal Name	C	15

4 K_RA	Nonwind Dependent Loss Factor	N	4
5 K_RB	Wind Dependent Loss Factor	N	5
6 N_FACTOR	Wind Exponent Factor	N	3
7 EFLT	Applicable for External Floating Tanks	L	1
8 DEFT	Applicable for Domed External Tanks	L	1
9 IFLT	Applicable for Internal Floating Tanks	L	1
10 WELDED	Applicable for Welded Decks	L	1
11 RIVETED	Applicable for Riveted Decks	L	1
12 SEC_USED	Secondary Seal Used	L	1

**STORAGE.DBF** - Stores information on individual mixture components.

<u>FIELD NAME</u>	<u>DESCRIPTION</u>	<u>TYPE</u>	<u>LENGTH</u>
1 IDX_ID	Internal ID Number	C	10
2 NAME	Chemical Name	C	30
3 WT_FRACT	Weight Fraction	N	6
4 VP_FRACT	Vapor Weight Fraction	N	6
5 WEIGHT	Relative Weight	N	9
6 MOLWT	Molecular Weight	N	8
7 L_DENS	Liquid Density	N	6
8 VP_MOLWT	Vapor Molecular Weight	N	8
9 VP	Average Vapor Pressure	N	12
10 VP_MIN	Minimum Vapor Pressure	N	12
11 VP_MAX	Maximum Vapor Pressure	N	12
12 REID_VP	Reid Vapor Pressure	N	12
13 ALS_TEMP	Avg. Liq. Surface Temp.	N	6
14 MLS_TEMP	Min. Liq. Surface Temp.	N	6
15 XLS_TEMP	Max. Liq. Surface Temp.	N	6
16 PRIMARY	= .T. if Primary Storage Rec.	L	1
17 CAS	CAS Number	C	15
18 MIX_ID	Internal Mixture ID Number	C	2
19 TANK_TYPE	Tank Type (Profile only)	C	25
20 PROFILE	= .T. if Profile Record	L	1

Indices:

<u>INDEX TAG</u>	<u>INDEX KEY</u>
IDX_ID	IDX_ID
NAME	upper(NAME)
PAD_ID	IDX_ID + STR(100000-recno(),6)
MIX_ID	IDX_ID + MIX_ID

**TABLES.DBF** - Contains information about the lookup tables in the program.

<u>FIELD NAME</u>	<u>DESCRIPTION</u>	<u>TYPE</u>	<u>LENGTH</u>
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1	FIELD_NAME	Tables Field Name	C	10
2	FIELD_TYPE	Tables Field Value	C	1
3	FIELD_LEN	Length of Label	N	3
4	FIELD_DEC	Number of Decimal Places	N	3
5	LABEL	Label	C	40
6	VALUE	Value	C	10
7	CONDITION		M	10
8	RANK		N	3

Indices:

<u>INDEX TAG</u>	<u>INDEX KEY</u>
VALUE	FIELD_NAME + UPPER(VALUE)
LABEL	FIELD_NAME + UPPER(LABEL)

**TANK.DBF** - Contains information about the tank type, structure, and characteristics.

<u>FIELD NAME</u>	<u>DESCRIPTION</u>	<u>TYPE</u>	<u>LENGTH</u>
1 TANK_TYPE	Type of Tank	C	25
2 IDX_ID	Internal ID Number	C	10
3 ID	Identification Number	C	10
4 DIAMETER	Diameter	N	4
5 HEIGHT_S	Shell Height	N	4
6 HEIGHT_R	Roof Height	N	6
7 HEIGHT_L	Maximum Liquid Height	N	4
8 VOLUME	Volume (gal)	N	9
9 RF_TYPE	Type of Roof	C	11
10 C_SLOPE	Cone Roof Slope	N	10
11 D_RADIUS	Dome Roof Radius	N	4
12 VENT_P	Breather Vent Pressure Setting	N	5
13 VENT_V	Breather Vent Vacuum Setting	N	5
14 TCOLOR	Shell Color	C	8
15 SHADE	Shell Shade	C	8
16 PT_COND	Paint Condition	C	4
17 RF_SHADE	Roof Shade	C	8
18 RF_COND	Roof Condition	C	4
19 RF_COLOR	Roof Color	C	8
20 S_COND	Shell Condition	C	13
21 Q_NET	Net Throughput	N	13
22 UNDER	= .T. if Underground	L	1
23 TURNOVER	No. of Turnovers/Year	N	6
24 TCITY	Actual City	C	25
25 TSTATE	Actual State	C	2
26 COMPANY	Company	C	30
27 CITY	City from Met. Database	C	20
28 STATE	State from Met. Database	C	15
29 C_MEASURE	Weight/Weight Percent	N	1

30 PROFILE	= .T. if Profile Record	L	1
31 SITE_PROF	= .T. if Site Profile	L	1
32 CONSTRUCT	Tank Construction	C	29
33 RIM_PRIM	Type of Primary Seal	C	15
34 RIM_SEC	Type of Secondary Seal	C	15
35 RIM_SEC_F	= .T. if Secondary Seal used	L	1
36 FITTING	Fitting Category	C	12
37 DECK_TYPE	Type of Deck	C	6
38 DECK_SEAM	Deck Seam Length	N	6
39 COL_NO	Number of Columns	N	3
40 COL_DIAM	Column Diameter	N	3
41 SELF_SUP	= .T. if Tank Self-Supported	L	1
42 HEIGHT_AL	Average Liquid Height (ft)*	N	4
43 DESC	Tank Description*	C	25
44 ATMOS_PRS	Atmospheric Pressure*	N	5
45 HEATED	= .T. if Tank Is Heated	L	1

Indices:

**INDEX TAG****INDEX KEY**

IDX_ID	IDX_ID
ID	upper(ID)
STATE	upper(TSTATE) + upper(TCITY)
CITY	upper(TCITY)
COMPANY	upper(COMPANY) + upper(TSTATE)

## APPENDIX B: ERROR MESSAGES

**[Field name] cannot be 0** - This field must have a non-zero value. Enter a value other than zero.

**[Field name] cannot be blank** - This field must have a value. Enter the correct value.

**[Field name] cannot exceed [field name]** - One field cannot logically be greater than another. For example, liquid height cannot be greater than shell height. Change one or both fields so that the first field is less than or equal to the second.

**Average [field name] > Maximum [field name]** - When there are three fields, Minimum, Maximum and Average, the Average value must be less than the Maximum value. Change one or both fields.

**Average [field name] < Minimum [field name]** - When there are three fields, Minimum, Maximum and Average, the Average value must be greater than the Minimum value. Change one or both fields.

**[Field name] must be greater than 0** - This field's value must be greater than 0. Enter the correct value.

**[Field name] cannot be less than 0** - This field's value cannot be less than 0. Enter the correct value.

**No [field name] has been specified** - This field must have a value. Enter the correct value.

**Tank construction must be given for bolted decks** - For internal floating roof tanks with bolted decks, the tank construction field must have a value. Enter the correct value.

**Chemical must be chosen from chemical list** - Only chemicals contained in the Chemical Database may be selected as components of the liquid.

**The chemical [Value] is not in the Chemical Database** - Chemical components must be entered into the Chemical Database.

**Vap. press. inconsistent with calculated value of [value]** - The entered vapor pressure is inconsistent with the program's calculated value. Check the vapor pressure and recalculate if necessary.

**Component percents, if given, must add up to 100.0** - When using weight percentages and the full speciation option, the weight percents must total 100.0 percent. Change one or more of the chemical component weight percentages.

**You must choose either multiple- or single-component stock** - This field cannot be blank. Enter the correct type of liquid stock.

**Vapor pressure of stored liquid exceeds atmospheric pressure** - A vapor pressure above the atmospheric pressure (usually 14.7 psia) will result in errors with emissions estimation procedures. A vapor pressure equal to the atmospheric pressure is at its boiling point. The

storage tank equations do not apply to boiling liquids. Check the site meteorological data and liquid information for accuracy.

**Breather vent range exceeds vapor pressure range** - The breather vent range must be less than the vapor pressure range of the stored liquid or the standing losses calculated will be less than zero. Check the breather vent settings. If the settings are correct assume standing storage losses are zero. Otherwise, correct the settings prior to generating a new report. Note that the fixed roof tank equations do not apply to pressure tanks.

**Vapor molecular weight cannot be zero** - You must enter a value for vapor molecular weight on the liquid information screen.

**Negative standing storage losses** - Change the pressure setting on the tank. The vapor space expansion factor is negative.

**Monthly throughput values do not agree with total throughput values** - The sum of all monthly throughput values do not add up to the annual throughput.

## APPENDIX C: CITIES WITH ALTERNATE METEOROLOGICAL DATA

For some of the cities in the Meteorological Database, monthly windspeed data or solar insolation factors were not available. For each of these cities, meteorological data from another city were used. The following is a list of these cities and the corresponding city from which the missing data were taken:

<u>City</u>	<u>City used for Insolation Factors</u>
Huntsville, AL	Birmingham, AL
Anchorage, AK	Homer, AK
Unakleet, AK	Nome, AK
Valdez, AK	Yakutat, AK
Flagstaff, AZ	Phoenix, AZ
Bishop, CA	Fresno, CA
Eureka, CA	Medford, OR
Redding, CA	Sacramento, CA
Santa Barbara, CA	Santa Maria, CA
Stockton, CA	Sacramento, CA
Alamosa, CO	Pueblo, CO
Bridgeport, CT	LaGuardia AP, NY
Fort Myers, FL	Tampa, FL
Gainesville, FL	Tallahassee, FL
Key West, FL	Miami, FL
Pensacola, FL	Mobile, AL
Vero Beach, FL	West Palm Beach, FL
Athens, GA	Atlanta, GA
Columbus, GA	Macon, GA
Kahului, HI	Honolulu, HI
Cairo, IL	Evansville, IN
Peoria, IL	Moline, IL
Rockford, IL	Chicago, IL
Dubuque, IA	Moline, IL
Waterloo, IA	Des Moines, IA
Concordia, KS	Grand Island, NE
Jackson, KY	Lexington, KY
Paducah, KY	Evansville, IN
Worcester, MA	Boston, MA
Houghton Lake, MI	Flint, MI
Lansing, MI	Flint, MI
Marquette, MI	Duluth, MN
Muskegon, MI	Grand Rapids, MI
Sault St. Marie, MI	Green Bay, WI
International Falls, MN	Duluth, MN
St. Cloud, MN	St. Paul, MN
Tupelo, MS	Memphis, TN
Kalispell, MT	Missoula, MT
Lincoln, NE	Omaha, NE
Omaha Epply AP, NE	Omaha, NE

Valentine, NE	North Platte, NE
Norfolk, NE	Grand Island, NE
Atlantic City AP, NJ	Philadelphia, PA
Albany, NY	Burlington, VT
JFK AP, NY	LaGuardia AP, NY
Wilmington, NC	Cape Hatteras, NC
Bismarck, ND	Fargo, ND
Williston, ND	Glasgow, MT
Akron, OH	Cleveland, OH
Mansfield, OH	Columbus, OH
Eugene, OR	Salem, OR
Williamsport, PA	Harrisburg, PA
Block Island, RI	Providence, RI
Charleston AP, SC	Savannah, GA
Aberdeen, SD	Sioux Falls, SD
Rapid City, SD	Casper, WY
Bristol-Johnson City, TN	Knoxville, TN
Oak Ridge, TN	Knoxville, TN
Galveston, TX	Port Arthur, TX
Milford, TX	Dallas-Fort Worth, TX
Victoria, TX	Corpus Christi, TX
Lynchburg, VA	Roanoke, VA
Walla Walla, WA	Pendleton, OR
Beckley, WV	Charleston, WV
Elkins, WV	Charleston, WV

**City**

Unakleet, AK  
Bishop, CA  
Alamosa, CO  
Lewiston, ID  
Dubuque, IA  
Milford, TX

**City used for Windspeed Data**

Nome, AK  
Fresno, CA  
Pueblo, CO  
Boise, ID  
Moline, IA  
Dallas-Fort Worth, TX